THUNDERBOLT II

AEROGUIDE 23

Fairchild Republic A-10A Thunderbolt II

AEROGUIDE 23: FAIRCHILD REPUBLIC A-10A THUNDERBOLT II

Published in Great Britain by Linewrights Ltd, PO Box 832, Ongar, Essex CM5 0NH, England

ISBN 0 946958 28 9

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Cover photograph by Joananne Chesneau
Photo processing by Frank Collins

Typesetting by Typesetters (Birmingham) Ltd, Smethwick, West Midlands
Colour reproduction by Columbia Offset (UK) Ltd, London
Monochrome reproduction by M&E Reproductions, North Fambridge, Essex
Printing and binding by Black Bear Press Ltd, Cambridge

ACKNOWLEDGEMENTS

This book could not have been produced without the assistance of the 81st Tactical Fighter Wing, RAF Bentwaters, and special thanks are due to Capt Victor L Warzinski, Capt John E Boyle, Sgt Helen Sheppard and TSgt Thaddeus Hosely of the 81st's Public Affairs Division for all their assistance. For help with photographs and technical material the publishers also wish to thank Kurt Singer, Fairchild Republic Company; Tom Duncan, Martin Marietta Orlando Aerospace; William Camp, Cradle of Aviation Museum; Aldo Speroni, General Electric Company; F M Slimmer, Hughes Aircraft Company; Harry Gann, Douglas Aircraft Company; Dick Ward; Mike Gething; and Lindsay Peacock. Uncredited photographs, copyright Linewrights, were taken by kind permission of the Commander 81st Tactical Fighter Wing.

Cover photograph: A-10A 80-0159 of the 92nd TFS, 81st TFW, autumn 1987.

Back cover plate: An A-10A of the 706th TFS, 926th TFG, Air Force Reserve, based at New Orleans.

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INTRODUCTION

The United States Air Force is, in the popular imagination, equipped with enormous intercontinental bombers and hundreds of Mach 2-plus interceptor fighters and strike aircraft. Some more enlightened minds grasp the fact that there are also a large number of support aircraft such as tankers, transports and training and communications aircraft, they will undoubtedly know that there are such things as 'spyplanes' and they may well have read something about 'stealth' aircraft, although these are top secret. If told that the Air Force also operates a modern jet combat aircraft that is none of these things, has a top speed of about 400mph, isn't packed with the latest computer technology, has a tail like a Lancaster and doesn't need two miles of concrete in order to land, the average Joe might be surprised. In the early 1960s, the thought that the USAF might be operating a front-line aeroplane like this fifteen years hence would have caused even a few Air Force generals to be taken aback.

What brought about some new thinking was the Vietnam War. While enemy aircraft could be shot out of the sky and military targets five hundred miles away blasted to oblivion, the sort of problem proving difficult to crack was answering a short-notice call from troops on the ground to deal with enemy activity in and around the immediate battlefield. Such targets tended to be highly mobile and of uncertain character, and an aerial strike tomorrow would not do. They might involve enemy personnel, vehicles or equipment, temporary depots or camps. Above all, they were right next door and they needed to be hit now.

Close air support, or CAS, is no new concept – indeed, it was one of the very earliest of all airborne missions – but the Air Force was not well equipped to promote it when things began to hot up in South-East Asia. The task was recognised, but it tended to be fufilled by second-line aircraft adapted piecemeal for the role. In many ways the Army's helicopters were showing the way: although these were also, at first, adaptations of existing designs, they at least demonstrated the virtues of being immediately on call and of remaining close to the scene of the action instead of having to perform high-speed, straight-line passes. Useful though they undeniably were, the helicopters could not lift very much, could not stay very long, and were horribly vulnerable to close-range ground fire.

The AX programme – Attack Experimental – was born out of the need to come up with something better than this. Initiated in September 1966, with a detailed requirement available to industry some six months later, AX called for a very manoeuvrable aircraft able to carry 16,000lb of ordnance of a varied nature and deliver it with great accuracy, and be capable of tight turns and long loiter over the battlefield. It should be simple in concept, to keep purchase price and maintenance costs down, be capable of operating from short, semi-prepared airstrips and be able to absorb significant battle damage so as to live to fight another day. It is probably true to say that the US political community was more receptive to this kind of aircraft at this particular time than it would have been at any other point in postwar history. Not only were the trials of the men on the ground in Vietnam being beamed into every domestic TV set in the United States day in and day out, but complex and highly expensive new aircraft were not everyone's favourite topic, given the furore surrounding the TFX (F-111) and C-5 at about this time. The AX appeared both necessary and affordable.

The development of the AX concept into the A-10 Thunderbolt is outlined in the next section, but the type has been well established now in US service for ten

Opposite page: FRC artwork showing the company's thinking early in the AX programme, complete with 'Vietnam camouflage'. The actual aircraft, when it emerged, was remarkably similar to this impression. *Fairchild Republic*
Right: 'Close' is the operative word as an A-10 is snapped at ultra low level during Joint Attack Weapons Systems (JAWS) trials in 1977, held to determine the optimum methods of employing close air support (CAS) elements. *Fairchild Republic*
Below: With a Paveway II LGB under its starboard side and a Hobo EO Mk 84 to port, a DT&E A-10 opens up during trials with the new GAU-8/A gun. *General Electric*

years. However, production of the A-10 ceased four years ago, no further orders came from the Air Force following its initial buy of just over 700 aircraft, no sub-versions have been purchased, no export sales have been achieved, there are already the beginnings of a tough competition to produce a successor for service in about five years' time (which could turn out to be, of all things, a re-vamped F-16), and the manufacturer, Fairchild Republic, has shut up shop. Yet the A-10 is an undeniable success: it appears to be exactly the right aircraft for the job, representing a triumph of experience over sophistication. A 'non-replacement' has, from time to time in aviation history, turned out to be the best successor to an established aircraft – for example the DC-3 and the Buccaneer – and it could be that the same will apply to the Thunderbolt II.

DESIGN & DEVELOPMENT

Ironically, Fairchild Republic were not among the early starters when the AX project was first drawn up in 1967. The preliminary study contracts were awarded by the US Air Force to General Dynamics, Grumman, McDonnell Douglas and Northrop, but when the submissions came in it was quickly evident that there were problems. Two engines appeared mandatory to meet the 'survivability' criteria, but jet engines were out because they drank too much and would not give the endurance required. A propeller-driven aircraft was therefore implied, but this in its turn brought difficulties since the arcs of the airscrews – necessarily big because long, fat blades were needed for short take-offs, especially when 16,000lb of ordnance was slung underneath – would place the engines well outboard from the fuselage, thus compromising single-engine control in the event of a disabling hit or malfunction. It became obvious from the initial studies that all the requirements could be met only by building a very large machine – and an inherently expensive one.

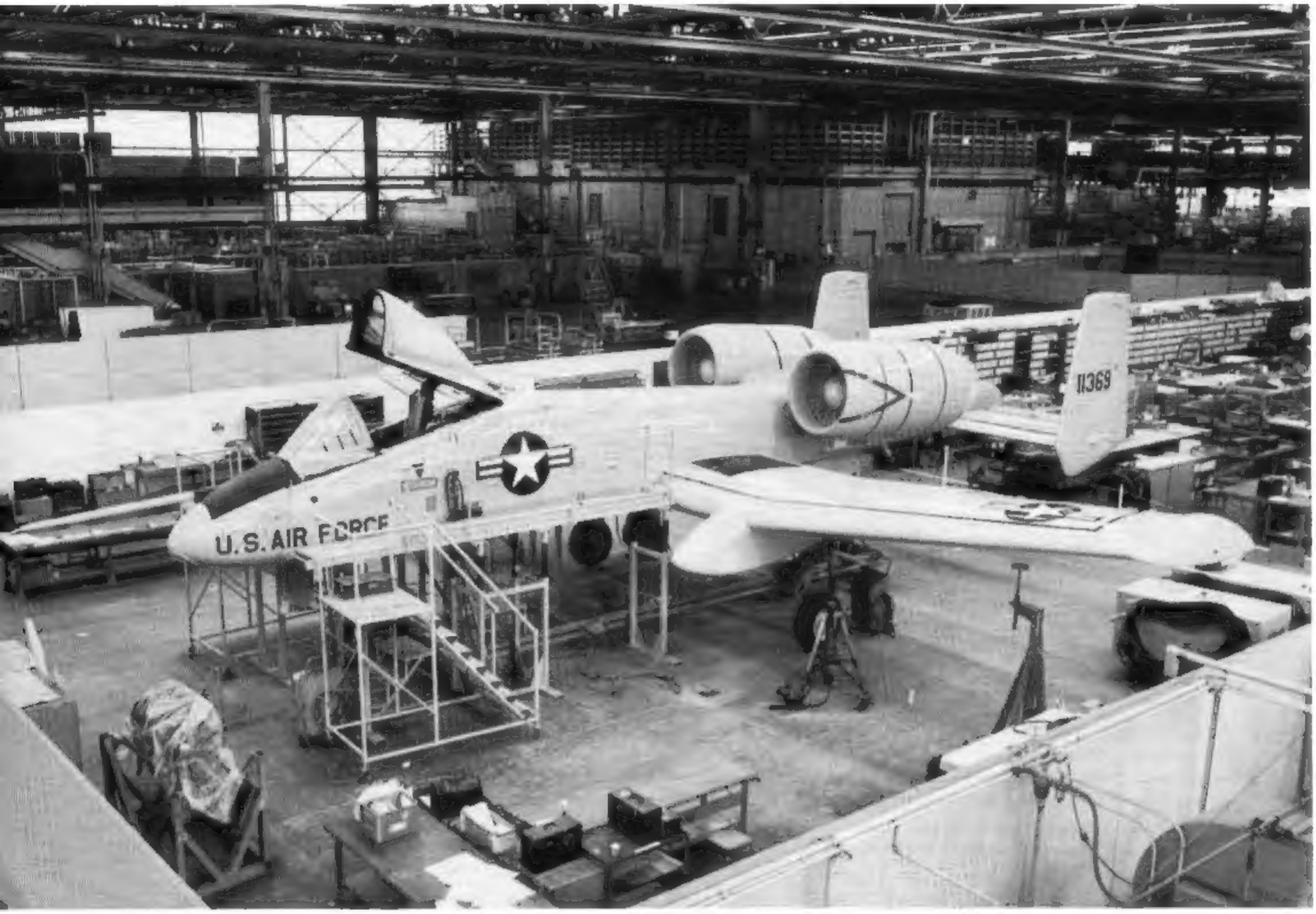
The Air Force thought again. A rising spiral of costs was absolutely the last thing that was needed, but on the other hand the AX was seen as a vital programme – events actually taking place cried out for it. Accordingly, some of the more stringent demands of the specification came to be relaxed: for example, the take-off and landing rolls were raised from 800ft to 4000ft, obviating the need for complex, weighty and costly high-lift systems, and the ordnance load was reduced by one-third when the aircraft was fully fuelled. These deliberations were, strangely, conducted at a leisurely pace, and it was more than three years before the final detailed proposals were issued. In the meantime, the question of how to power the aircraft had, in a way, resolved itself when it became increasingly apparent that the new-technology turbofan engine, which combined tremendous thrust with great fuel economy, was reliable and cheap enough to be taken on board – and it did not need an external propeller.

When the official RFP (Requests for Proposals) were issued in May 1970, only two of the companies involved in the preliminary investigations, Northrop and General Dynamics, chose to follow through, but Boeing-Vertol, Cessna, Fairchild Republic and Lockheed joined the competition. It was made clear, with the Total Package Procurement system somewhat discredited in the light of the TFX/F-111 affair, that, from the six submitted, two designs would be selected for further development, culminating in a fly-off to determine the outright winner.

In December 1970 Fairchild Republic and Northrop learned that their proposals had been accepted, and the manufacturers were awarded contracts valued at $41.2 million and $28.9 million respectively to build two prototypes each. When the aircraft emerged in the spring of 1972, the configurations were startingly different. The Northrop contender, designated YA-9A ('Y' denoting a pre-production aircraft), followed a traditional layout, with engines tucked well into the fuselage 1950s-style, high-set wings, a broad fin and dihedral tail, the whole set low to the ground on a short, narrow-track undercarriage. Fairchild Republic's prototype, the YA-10A, looked quite unlike any military aircraft that had ever flown, with its two engines mounted in pods high on the rear fuselage in an arrangement more familiar to airliner spotters, twin fins outboard of the jet efflux, a low-set, dihedral wing and a stalky undercarriage with the main gear retracting into special streamlined pods mounted at the wing leading edge. Bizarre was not too strong a description. Apart from the rotary cannon mounted low in the nose and a seemingly endless row of weapons pylons strung out beneath the massive unswept wings, the two rivals appeared to have practically nothing in common. Even the engines were different, the A-9 using Lycoming YF102s and the A-10 being fitted with General Electric TF34s.

Within six months of their delivery to Edwards AFB, all four aircraft were being evaluated by a special Joint Test

Left: Northrop's contender in the AX competition, the YA-9A, could hardly have been more different in appearance from the YA-10A though shared with the latter a thick-section, high-lift wing capable of supporting a heavy warload. One innovative feature of the A-9 was side-force control, wherein the use of one of the wing-tip air brakes in conjunction with opposite rudder would move the aircraft laterally without it banking or turning – a 'plus' when tracking a moving target. These two views show the second prototype, 71-1638, following its retirement, March AFB.
Right upper: The first of the two YA-10As nears completion at Farmingdale. *Fairchild Republic*
Right lower: The first YA-10A, photographed on 16 March 1972, just after the official roll-out. Within a few weeks it would be at Edwards. *Fairchild Republic*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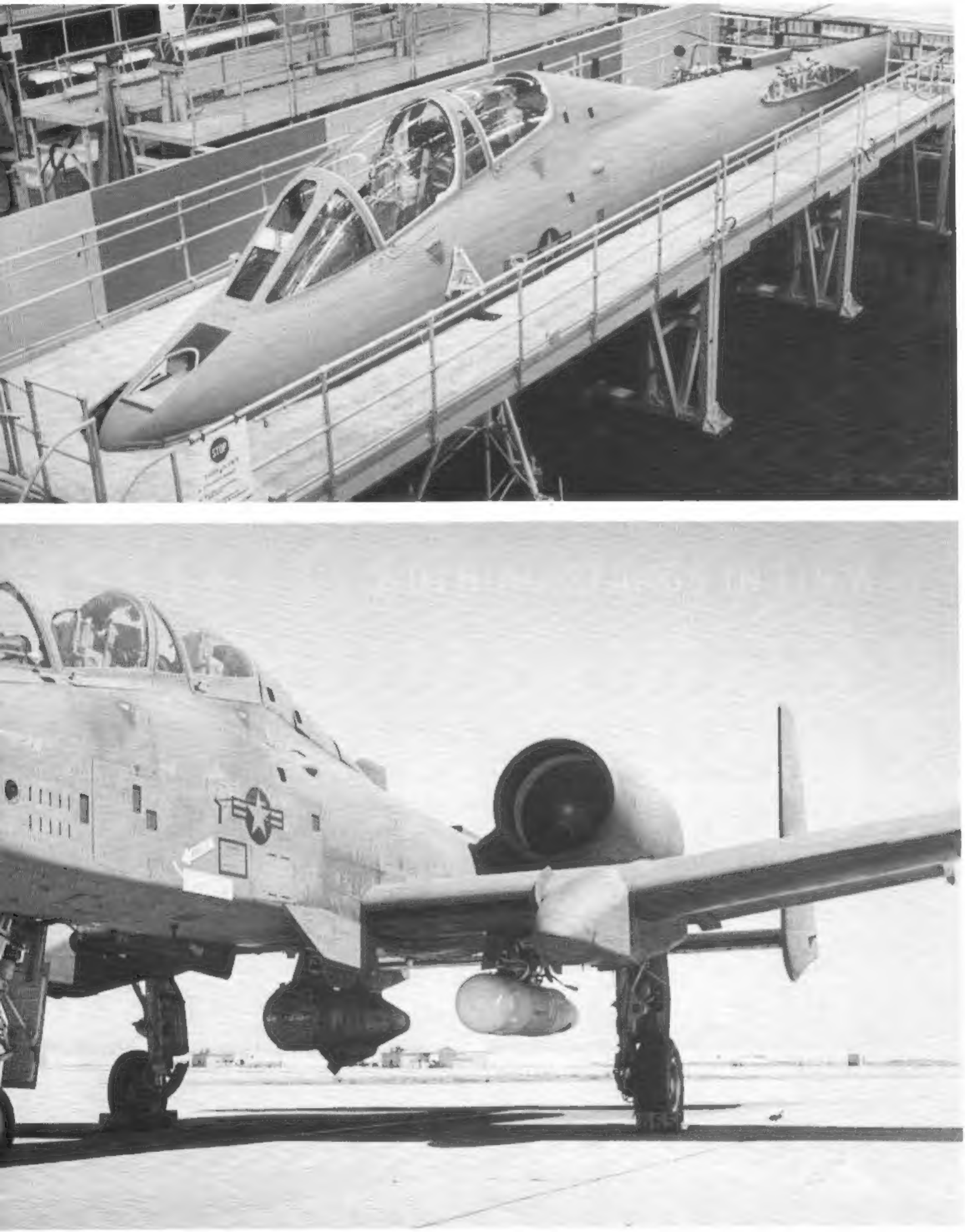
Above: The first YA-10A up on a test flight, toting Maverick air-to-ground missiles and equipped with cameras forward and aft and beneath the wing tips to study the way the weapons release. Note that strakes have been added forward of the wing root to help smooth out the airflow entering the engine pods; these would become standard for production aircraft. *Fairchild Republic*

Right: One of the pre-series A-10s was converted to two-seat configuration at company expense and tasked with demonstrating the night/all-weather attack capabilities of the design. Here the completed fuselage is seen at Farmingdale. *Fairchild Republic*
Below: The A-10 N/AW with avionics pods installed beneath the wing centre section. *Fairchild Republic*

Force (JTF) set up by the US Air Force. All aspects of the programme were throughly examined, not only the flying characteristics of the competing designs but also the effectiveness of the weapons systems, the reliability and survivability of the internal systems and, mindful of operating costs, the ease with which the aircraft could be maintained. The decision was fast in coming, for by mid-January 1983, after each type had put in almost 150 hours of flying time, it was announced that the A-10 had won, mainly on the grounds that it would require considerably less work than the A-9 to make a production-standard aircraft out of it but also because it looked as though it would be far easier to maintain and would accept more damage over the battlefield without being put out of action. It should be said, however, that both participants comfortably exceeded the demands of the USAF specification.

Life for the A-10 from then on was not all sweetness and light, however, although the programme was not to be bedevilled by the political and financial torment inflicted on one or two other recent US military programmes. One of the snags with fly-off competitions is that although the merits of the competitors can be directly compared and a rational assessment of their respective qualities and (perhaps) failings made, the programme is susceptible to pressure that might be applied by various interested parties. Politicians who represent constituents, for example, will, either out of genuine concern or because their careers need to be advanced, try to ensure that government contracts favour their particular corner of the world, disregarding the fact that parochial interests may not necessarily coincide with national interests. It's only natural. From a completely disinterested point of view, this can lead to an almost unending series of arguments, enquiries and possibly in-fighting which as part of the democratic process is doubtless all to the good but, unfortunately, invariably causes complications, delays, cost increases and other headaches. Such exertions affected the A-10 programme to some degree, culminating in a September 1973 directive that the aircraft should be evaluated against the



Left: Four early-production A-10s assigned to the 355th TFTW at Davis-Monthan AFB fly in formation. By this time the lower leading edges of the vertical fins had been enlarged to a more rounded shape. The 355th was the primary training unit for the A-10. *Fairchild Republic*
Below left: A pale grey A-10 at RAF Bentwaters, prior to the full-scale deployment of the aircraft to Great Britain. Although AX was conceived during the Vietnam War, that conflict was over before deliveries of production A-10s to the USAF got under way, but the suitability of the type to the European theatre was appreciated early on in the programme. *US Air Force*
Below right: A ground crewman converses with an 81st TFW A-10 pilot via the intercom during pre-flight checks. Although a replacement for the A-10 is actively being sought, it is expected that the type will continue in service for very many years yet. *US Air Force*

Vought A-7 Corsair, a type well established in US Navy and Air Force service. The A-10 rode out this problem successfully, but it was well over a year later before the first production order, for 52 aircraft, was forthcoming – two and a half years after the fly-off competition.

DT&E (Development, Testing and Evaluation) had meanwhile been proceeding, the two original A-10s being joined from early 1975 by the first of six pre-production aircraft. True to the manufacturer's prophesies, the trials were demonstrating that remarkably little change would be needed to turn the YA-10A into a production machine. Fine tuning was applied to the shape of the wing, canopy, engine pods and undercarriage housings, but nothing of a really fundamental nature was involved. The one anxiety was the brand new GAU-8/A 30mm cannon. The development of this weapon, specified in the 1970 RFP, was being carried out by General Electric in parallel with the AX programme, and although ground firing had produced spectacular results nobody knew for sure how the gun, or for that matter the aircraft, would behave when an A-10 pilot let rip with it. There need have been no worry. The only snag – the flash caused by the

ignition of unburnt propellant as the projectiles emerged from the seven barrels of the system – had been fixed before the GAU-8/A was installed in the aircraft, and everything else about the gun exceeded expectations, with hitherto impenetrable tanks being blasted to pieces at unheard of ranges, with great accuracy and with surprisingly little kick.

Designed and produced during the agonies of the Vietnam War, the A-10 never did see action in South-East Asia, first entering service with the US Air Force in early 1977, some four years after the American involvement there had been brought to a close; indeed, the aircraft had not yet been officially sanctioned by the time the troops came home. The heartsearching that accompanied the pull-out and continued for some time afterwards might perhaps have been expected to result in the cancellation of the project, but prudence defeated emotion and the value of the CAS role – and of the new aircraft that had been designed to fulfil it – was perceived as remaining high, especially in relation to the US commitment to the defence of Europe. The type of battlefield which had prompted the AX programme in the first place was not quite the same as that which might be expected should the massed formations of Soviet armour move menacingly westwards, and the sort of weather conditions that might pertain while they did so were not quite what the AX programme management team originally had in mind when they drew up the RFP specifications, but the A-10 nevertheless seemed pretty well suited to the European scene, especially in view of its amazing gun power and the availability of hundreds of concrete strips from which it could operate

The Fairchild Republic Company responded to this change of direction enthusiastically, and for five years lobbied hard for the adoption of a specialised two-seat variant which would answer the problems posed by the frequently foul North European weather conditions and also enable the A-10 to hit targets at night. One of the development aircraft was modified to accept a second cockpit, dual controls were installed, the fins were enlarged in area, and an avionics suite comprising a basic radar, an inertial navigation system (INS), a low-light TV (LLTV) system and a forward-looking infra-red (FLIR) and laser seeker was slung in pods beneath the aircraft; in the proposed production variant the suite would be relocated in the wings and gear fairings, reducing its vulnerability to ground fire and freeing the undersurfaces once more for weapons carriage. The USAF did order a number of A-10 two-seaters, but for training purposes only, and these were subsequently cancelled. The N/AW version, despite extensive and successful trials over a long period of time, did not catch on, the Air Force preferring to place its faith in the sophisticated Low Altitude Navigation and Targeting Infra Red for Night (LANTIRN), a strap-on pod that, it was expected, would turn any strike aircraft into an effective night-time and bad-weather operator

The last A-10 was rolled out in early 1984 and no more production aircraft of any sort have been built by Fairchild Republic for the US services since then. The completion of the A-10 order left a void which, it was expected, would be fulfilled by a contract covering a new USAF trainer. The T-46, another twin-finned aircraft, flew for the first time in October 1985 but the project was subsequently cancelled owing to budgetary restrictions This blow to the company was bitter indeed, and FRC (although not the parent organisation, Fairchild Industries) effectively went out of business at the end of 1987. The company responsible for the 'Thunder' series – the P-47 of World War II fame, the F-84 range of first- and second-generation jets and the mighty F-105 'Thud' which served with such distinction over Vietnam – was no more.

The home of the A-10 is nowadays not far from its original location at Farmingdale on Long Island, since all spares, engineering and support activities are in the capable hands of the Grumman Corporation. Most of the FRC personnel directly involved in the A-10 back-up programme also transferred to Bethpage, and such support activities will continue to be co-ordinated here. How long the A-10s will remain in the front line is another question. Air Force generals keen for change have described the aircraft as 'aged' and 'in need of replacement', which considering the fact that it was preceded into service by the F-15 by a margin of more than two years seems an exaggeration. If a new aircraft does come along, it will probably be faster and more sophisticated. Whether it will be able to manoeuvre as well at very low speed, lift as much, fly for as long, take as much punishment or fire 12in long, 2lb cannon shells is open to discussion.

STRUCTURE

As with all military aircraft, the A-10 represents what its manufacturer considers to be the best set of compromises given the sort of task the machine has to tackle. Unlike many other warplanes, however, the A-10 is assigned a singular, specialised role, and as a result its designers were less constrained: not having to be all things to all men, the aircraft could reflect more fully the ideals to which they aspired, given the need to keep the project within budget

The A-10 had to be large: its twin engines, its heavy warload and the eschewal of any vulnerable external fuel tanks guaranteed that its dimensions would be impressive. And it had to carry that enormous internal gun, beside which the average family car looks small. For its size, however, the aircraft is not unduly heavy, weighing considerably less than an F-4 Phantom.

The capacious fuselage comprises three basic assemblies. Up front is the aircraft's GAU-8/A gun system, atop which is the pilot's cockpit and to starboard of which, offset from the fuselage centreline, is the nosewheel bay. The nose of the aircraft slopes sharply away from the windscreen – giving the pilot an excellent view forward from his high-set seat – and houses an inflight-refuelling receptacle; behind the pilot is the principal avionics accommodation, sited over the gun's enormous ammunition drum. Virtually the entire centre section of the fuselage is taken up with fuel tanks, while the rear fuslage carries the bearers for the two engine pods and, further back, the tailplane, together with various accessory systems.

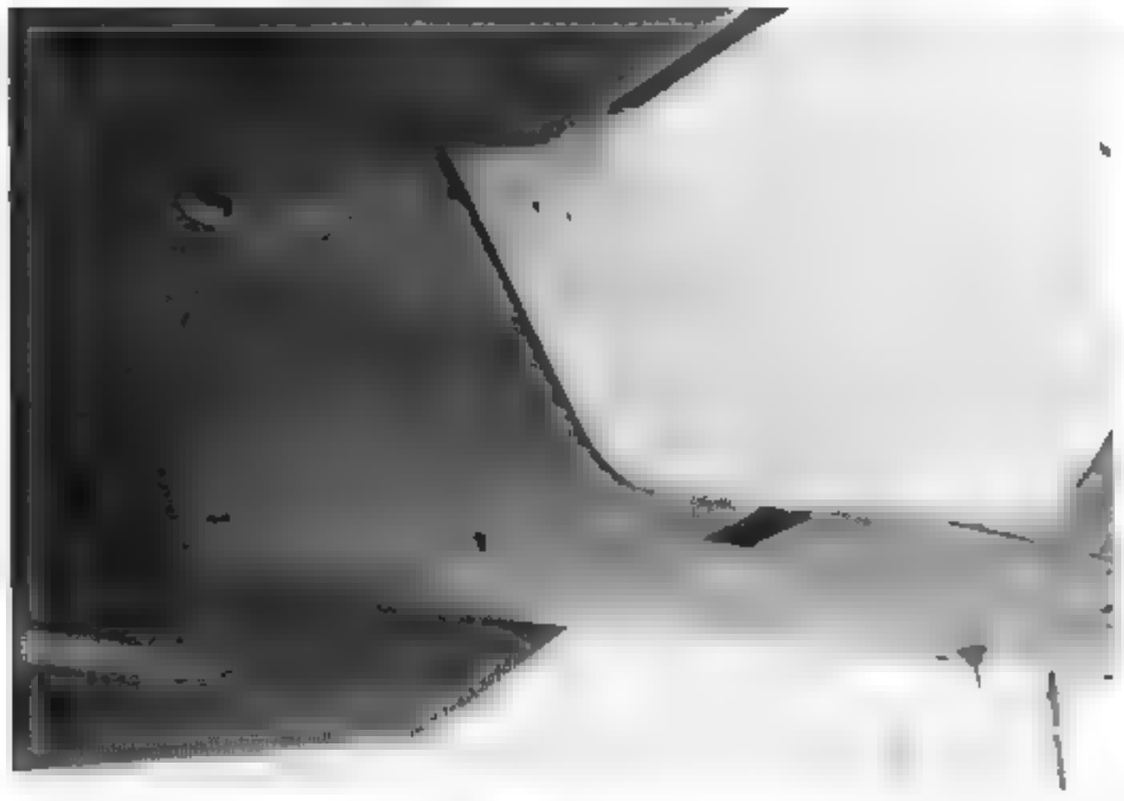
The wing is similarly arranged as three principal assemblies, the one-piece centre-section providing the airframe with great structural strength, unweakened by the main undercarriage bays which are designed as aerodynamic pods well outboard. The centre-section encloses an integral fuel tank, but the outer wing panels, featuring noticeable dihedral, are 'dry'. The short-field performance and heavy ordnance load required by the AX specification is met by the unusually thick section of the wing, which not only produces good lift but is also immensely strong whilst not unduly weighty. Massive, curved flaps slide out on tracks from the trailing edges of the centre-section, and huge ailerons, splitting laterally to form air brakes, take up most of the trailing edge of the outer panels, all aiding lift and providing excellent low-speed agility. Unusual downturned wing tips further help manoeuvrability and reduce drag.

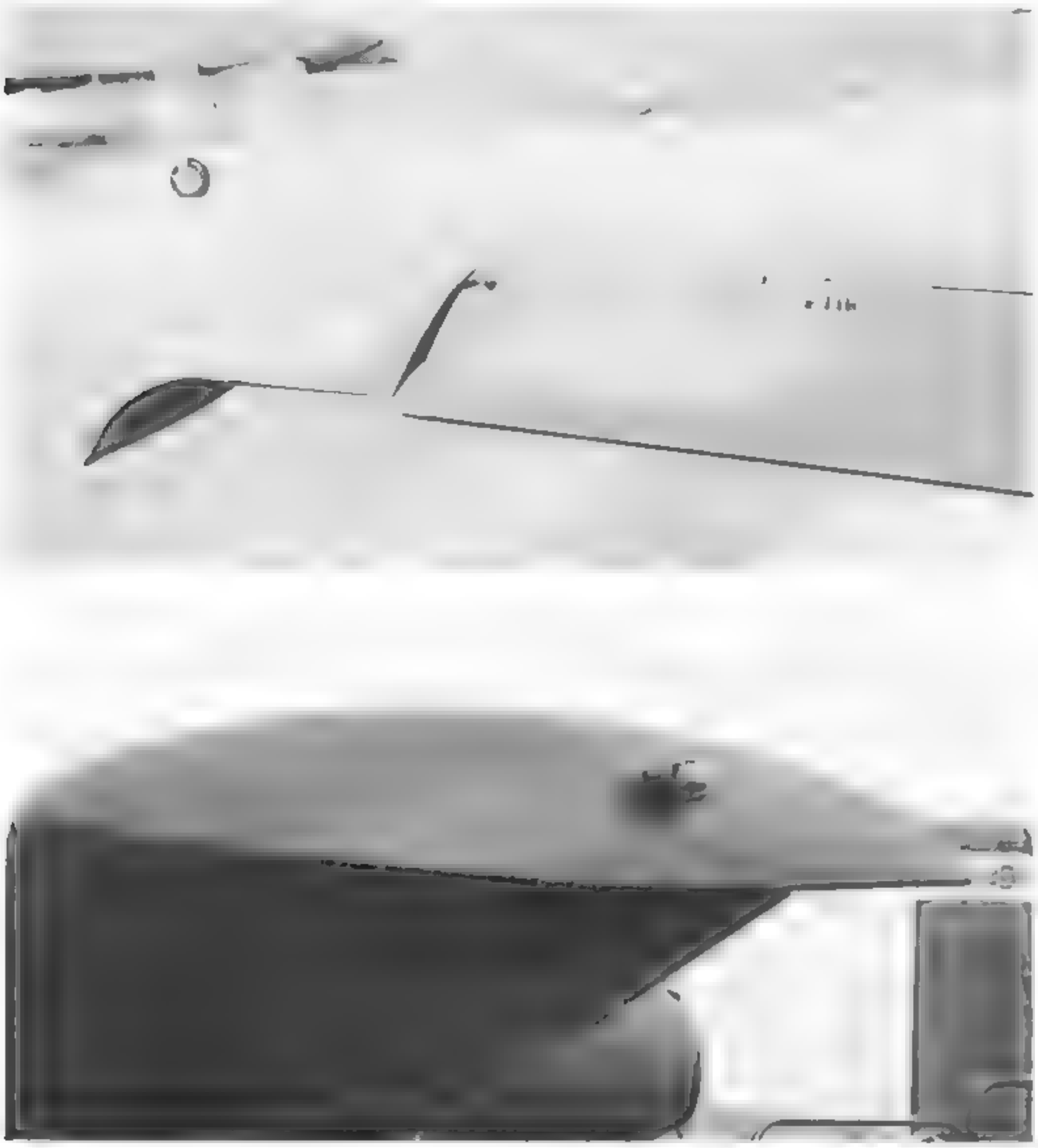
Whilst the A-10 is an aircraft of undeniably unusual configuration, it should be remembered that there are very good reasons for its offbeat appearance. The key to the whole layout is not so much the various requirements of the role but rather just one aspect – survivability. Indeed, FRC went so far as to produce a special 48-page handbook devoted to the subject. In descending order of vulnerability, critical features in the face of ground fire were, after a detailed study of combat losses over Vietnam, analysed as being the fuel system, the pilot, the primary flight controls, the powerplant (for a single-engined aircraft) and 'airframe structure and miscellaneous'; the powerplant system (as a whole) for twin-engined aircraft rated below these, and the ammunition drum for the A-10 was estimated as being the second most vulnerable area. This data was taken very much to heart by the A-10 design team, and a host of safety provisions were made, for example the purging of the refuelling line to prevent fires and the use of electric fuel pumps instead of tank pressurisation (among a plethora of measures to protect the fuel system); the introduction of armoured aluminium beneath the ammunition drum and the enclosure of the cockpit with armoured titanium; duplicated control cables spaced widely apart and backed up with a manual flight control system; and catering for the loss of whole sections of the aircraft (such as half the tailplane) without necessarily fatal results. Truly is the A-10 the most survivable aircraft ever built.

Below left: ts engine intakes protected against FOD (fore gn ob ect damage an 81st TFW A 10 wa ts at Bentwaters for ts next m ssion The f at topped nose contours g ve the p lot an excellent v ew forw ard especa ly of an inflight refue in g boom as it inches towards h m!

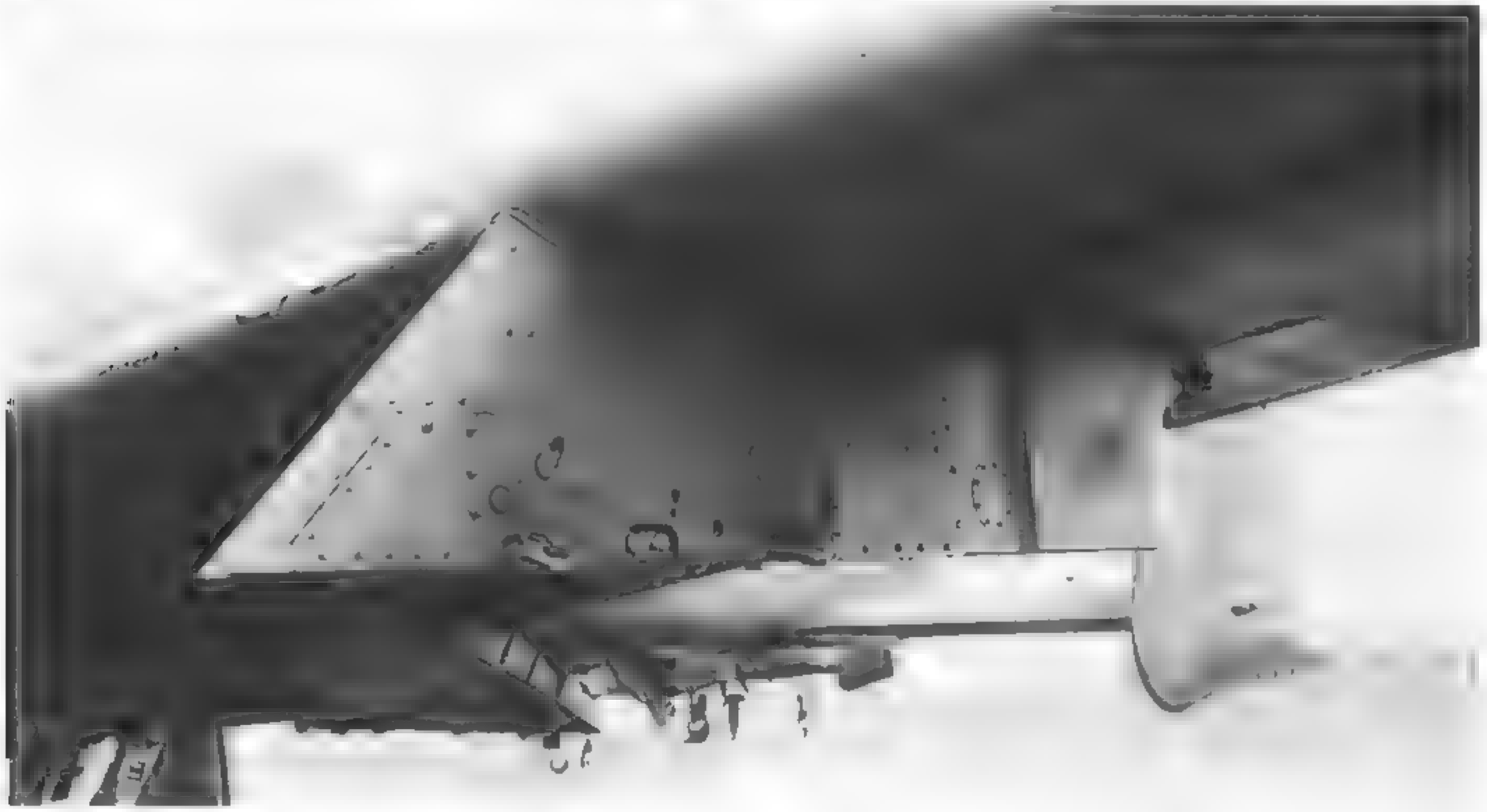
Above and below Two v ews of the front fuse age show ng the vent ng scoop bene th the m ass ve GAU 8 A g n barre s and the twin threat w arn ng rec eiver domes above The A 10 carr es no radar system so t s qu te n order to pa nt the 'last three' of the serial number across the nose

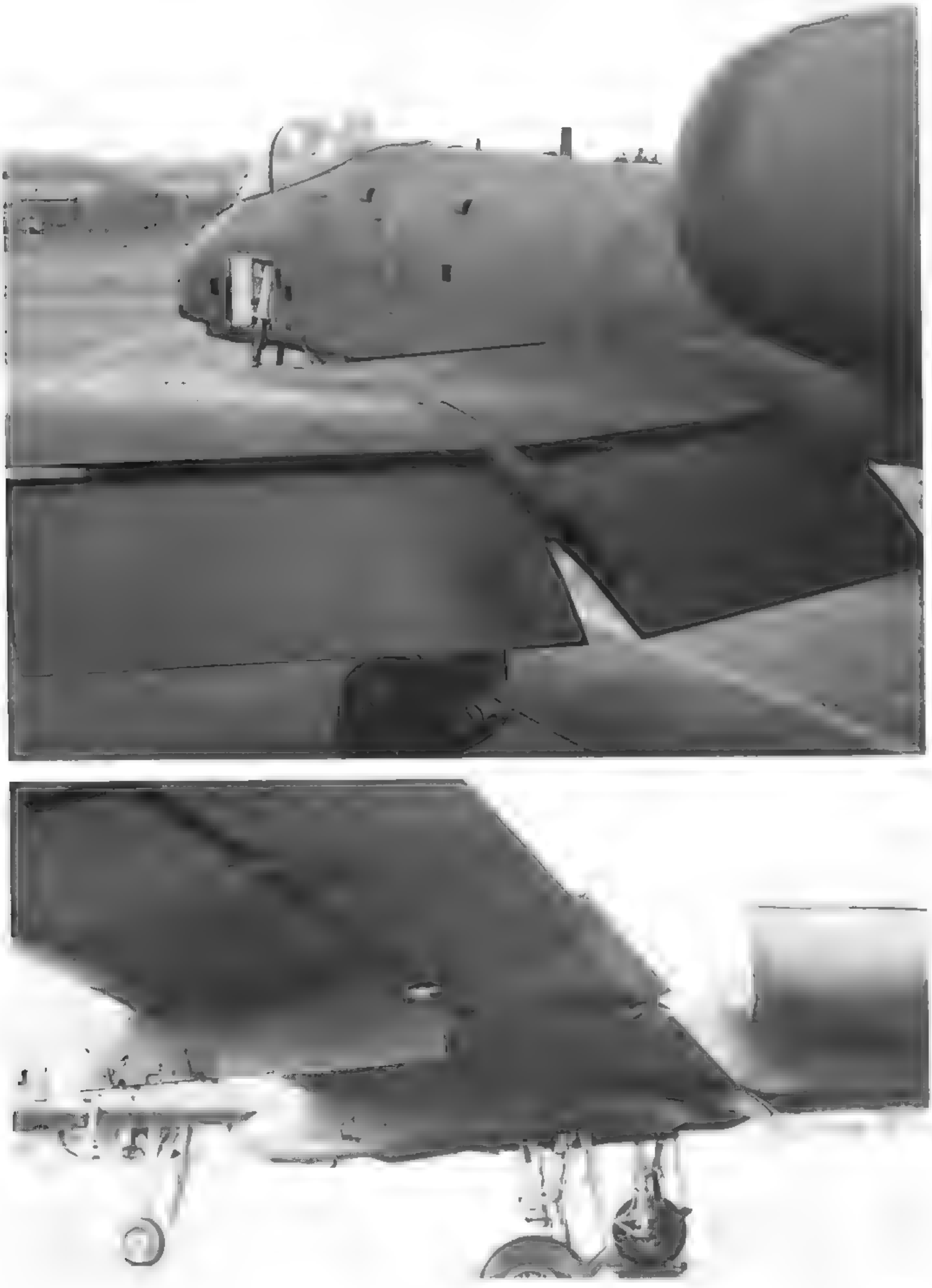
Top left and centre: Cockpit canopy hinges upwards for pilot's access; note collapsible stay immediately behind seat
Left: Boarding ladder is telescopic and deploys under gravity when the hatch door is opened. YA-10As did not have this feature
Above: Ladder hatch detail on 82-0647, showing 511th TFS ('Vultures') badge on left and USAFE shield on right
Opposite page top: Undersides of front fuselage, showing airflow plates and 'towel rail' VHF antenna
Opposite page centre: Mid-fuselage area, port side, showing location of Wing badge and national insignia
Opposite page bottom: Close-in views of airflow strakes at root leading edge





Left upper: View of port wing tip, showing pronounced camber to improve aileron efficiency particularly at low speeds
Left lower: Navigation and strobe lights on the outboard surface of the port wing tip
Below: Port wing undersurface, with pylon at No 1 station prominent. Note abrasion along wing leading edge inboard of pylon
Right upper: Each of the A-10's wings features a pair of substantial flaps, giving tremendous additional lift when fully deployed for take-off or landing or partially for extra agility over the battlefield. As can be seen here, the flaps not only endow the wing with extra area, but they also dramatically increase the chordwise camber. Antennas along the top of the fuselage are for IFF (nearest canopy) UHF and TACAN
Right lower: General view beneath port wing. The ailerons function conventionally but also open out scissors-fashion to act as air brakes (note gap along trailing edge), the trim tab remaining with the upper components. Notice how the aileron actuators are partially enclosed by the weapons pylon (which differs in shape from that at No 3 station)





Above: Two photographs illustrating the limited-travel slats fitted to the inboard wing leading edges. During proving trials it was found that when flying at low speed in a nose-high attitude the A-10 generated air turbulence along the wing roots which affected the performance of the pod-mounted engines, and both the slats and the wing-root strakes beneath represent the efforts made to cure the problem
Right and below: Views of the unusual undercarriage pods The hinged nose section of the port pod gives access to the fuelling point, its distance from the engines allowing replenishment when the latter are running Note earthing point
Opposite page top left: One of the two YA-10As under construction, giving a good impression of the fuselage structure *Fairchild Republic*
Opposite page top right: An interesting photo looking up at the YA-10A fuselage showing the nosegear bay offset to starboard and the massive bays for the gun. *Fairchild Republic*
Opposite page bottom: The basic wing structure, ready for mating to the fuselage The huge curved tracks for the flaps are well in evidence. *Fairchild Republic*

Above Over the wing view of 82-0647 511th TFS, 81st TFW. Crew name flash on cockpit canopy framing is in Squadron colour (black)
Right: 81st TFW badge is carried in attractive low-key colours on USAFE A-10s, as here on '0647
Below: A-10 80-0159, 92nd TFS. Note USAFE insignia aft of cockpit
Far right top: 82-0647 drying off after a shower, affording a good view of the starboard engine pod
Far right bottom: Port aspect of 80-0159, ready for boarding. The inside of the door closing the crew steps hatch here again in the Squadron colour, is a favourite location for personal mementos, zaps and the like

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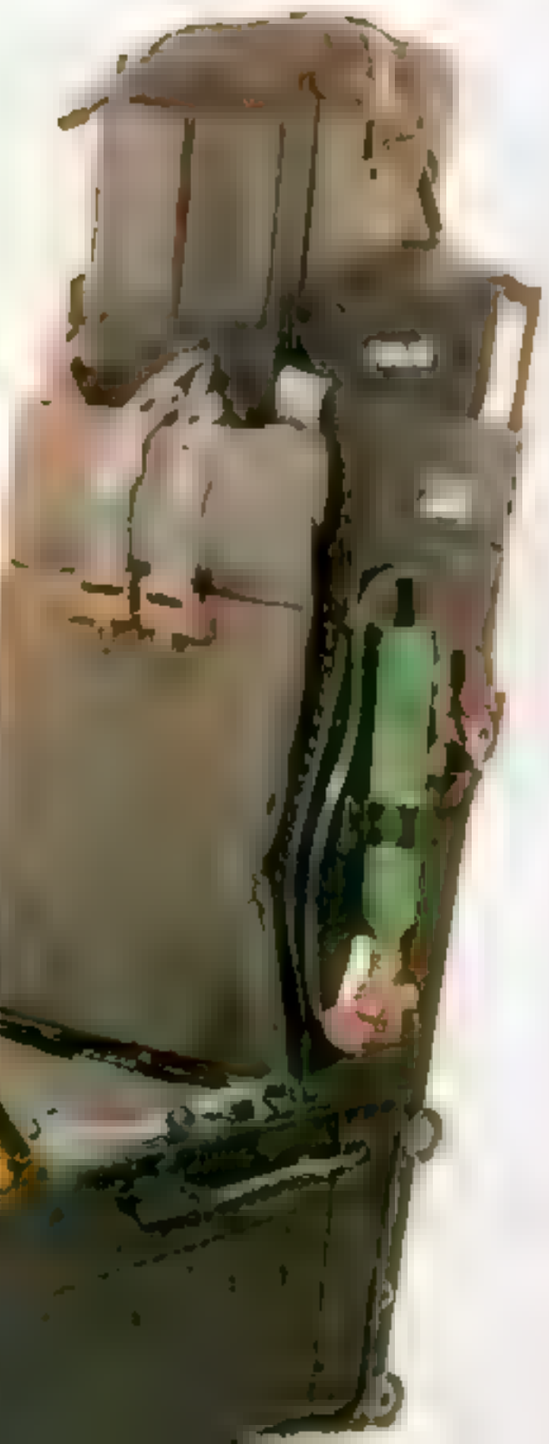
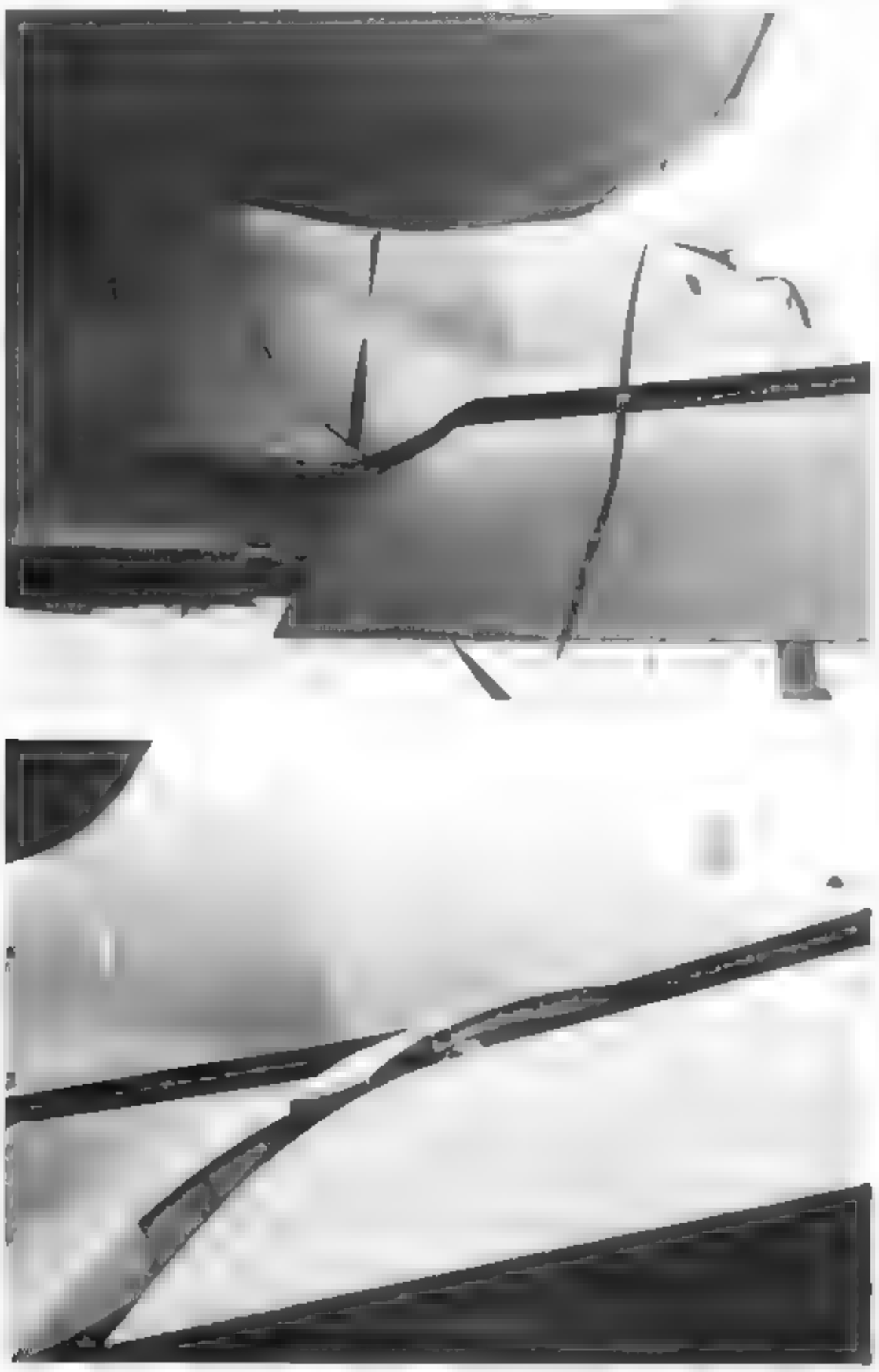
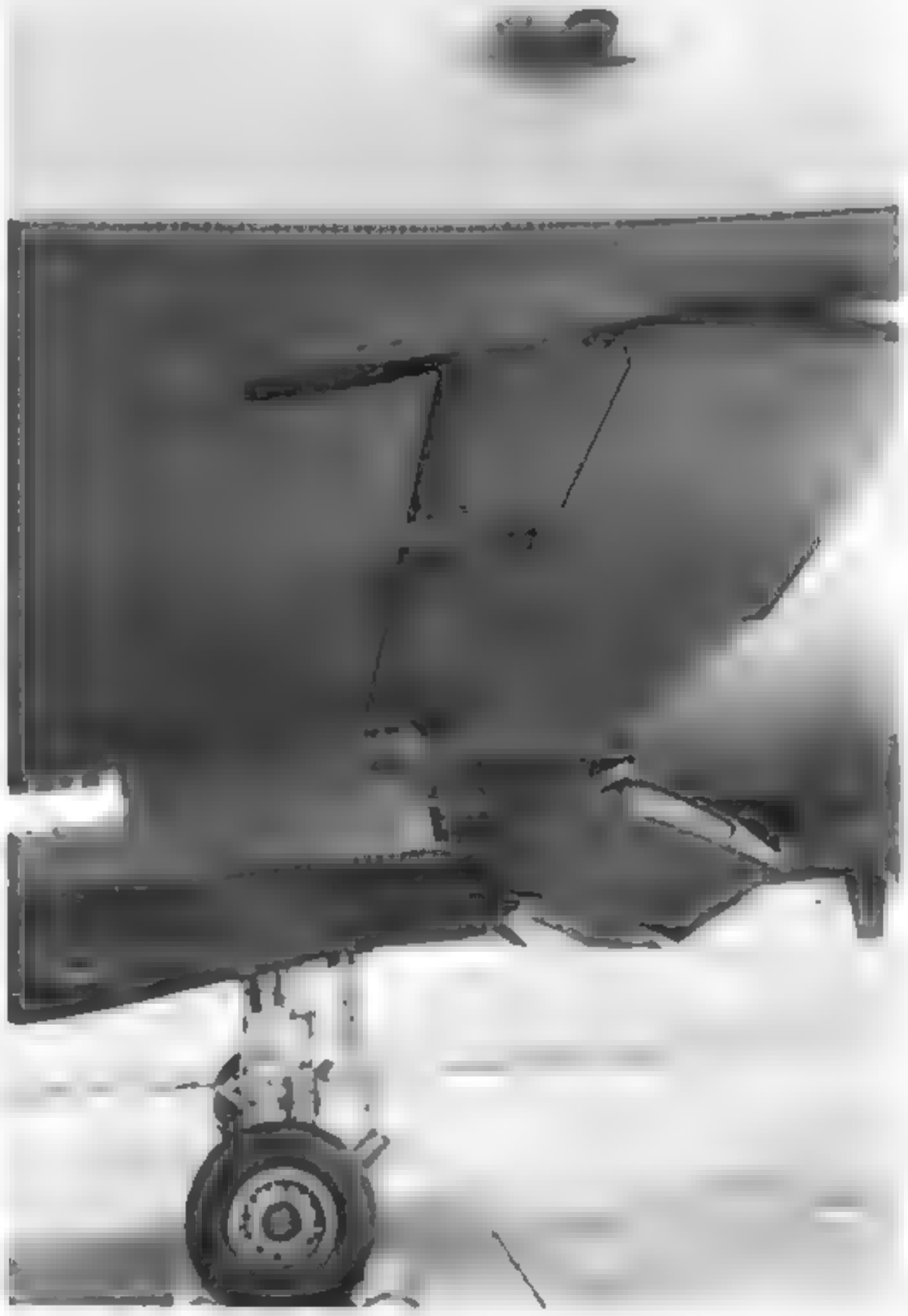
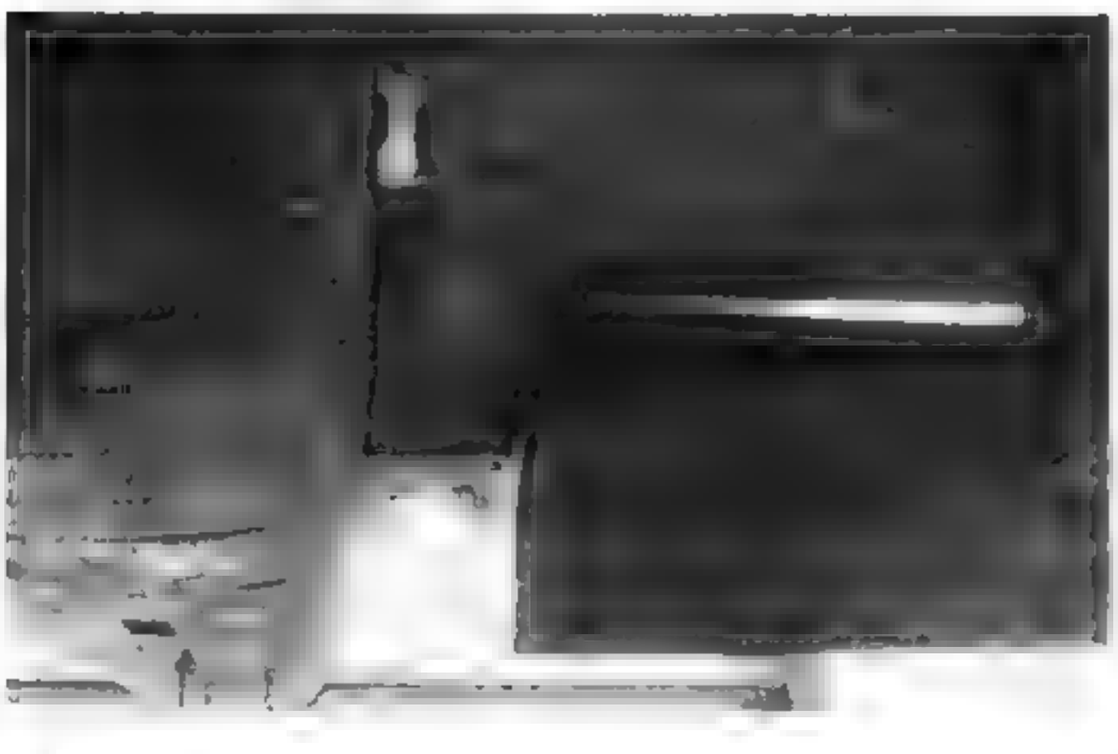
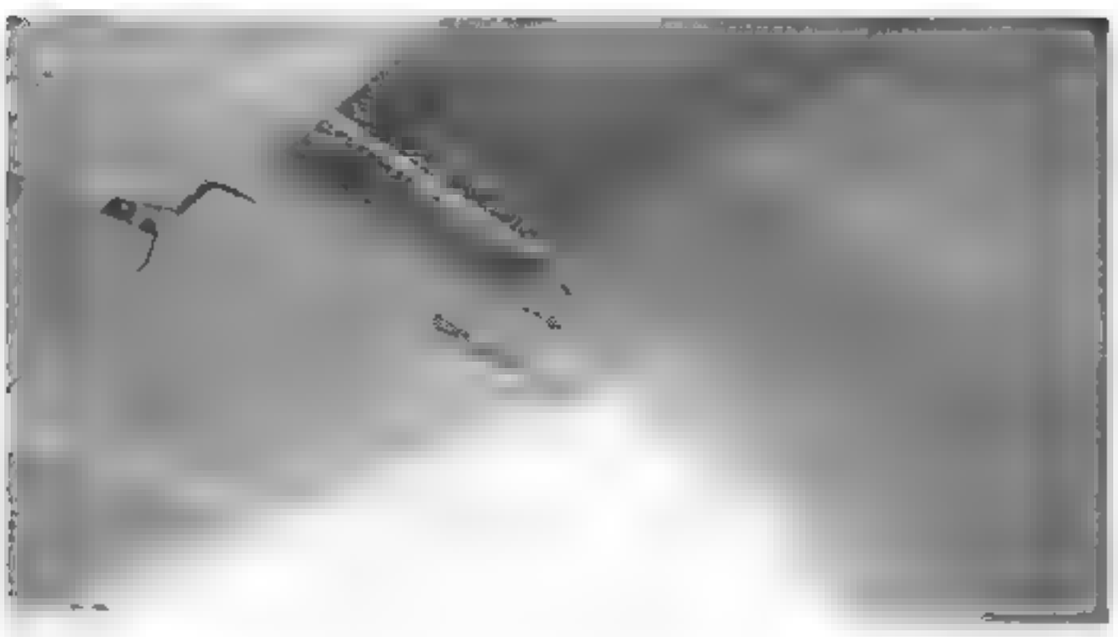


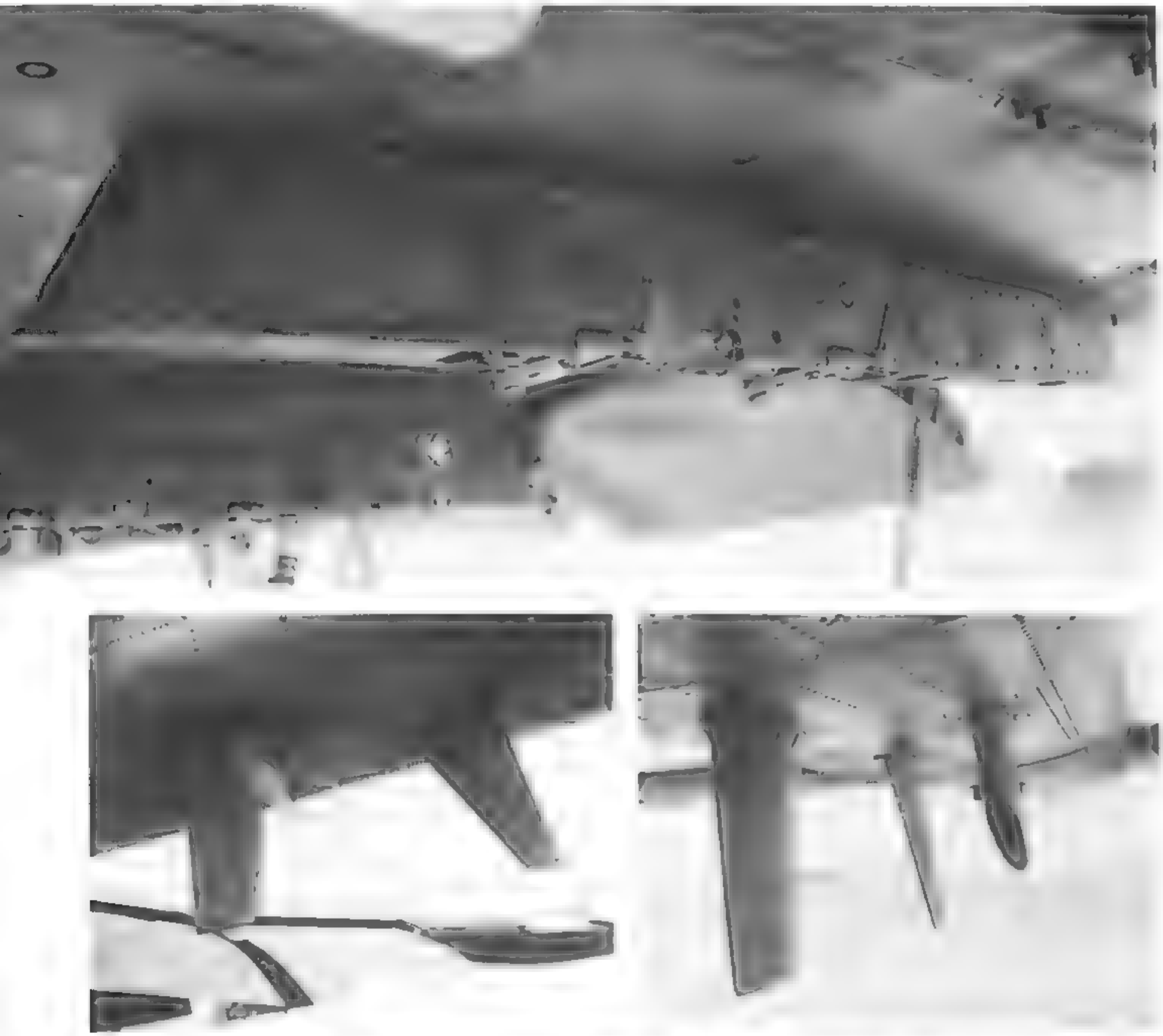






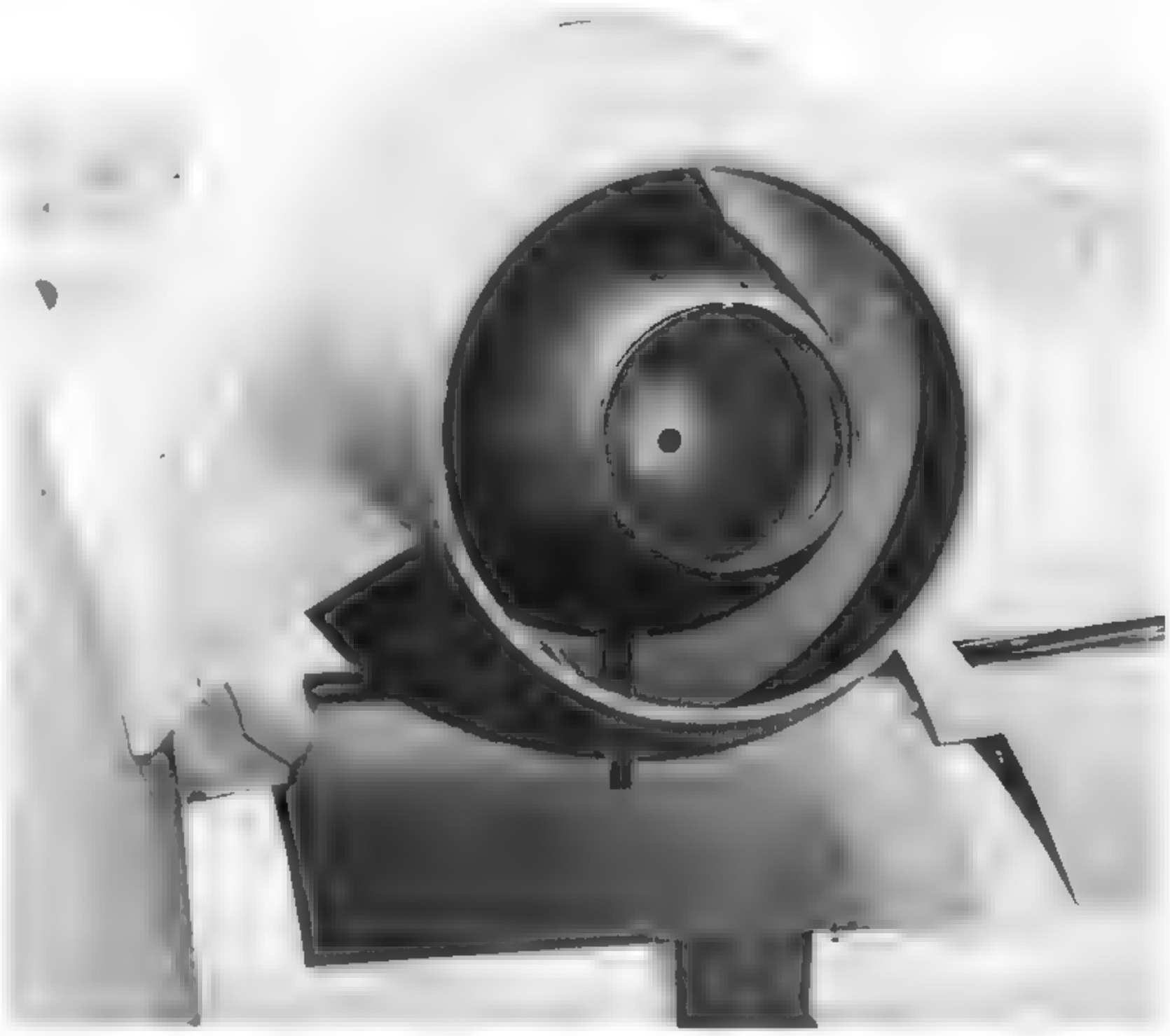
Opposite page top: The A-10 quickly assumed the nickname 'Warthog' in USAF service, and in the 917th TFG (AFRES) ost no time in applying the appropriate decor! *Fairchild Republic*
Opposite page bottom left: Inboard view of starboard main undercarriage gear
Opposite page bottom right: ACES II ejection seat as fitted to production A-10s. The prototype aircraft were equipped with FRC-designed seats, and it was originally proposed to fit all production models with the Escapac 1E-9. Numerous other changes were made to the cockpit, including a revised throttle quadrant, a modified control stick and new rudder pedals – and an improved canopy. *McDonnell Douglas*
This page: Further angles on the flap system. Note the prominent wing root fairing at the trailing edge, and also how the undercarriage gear pod is angled down at the rear to allow the inboard flap to operate

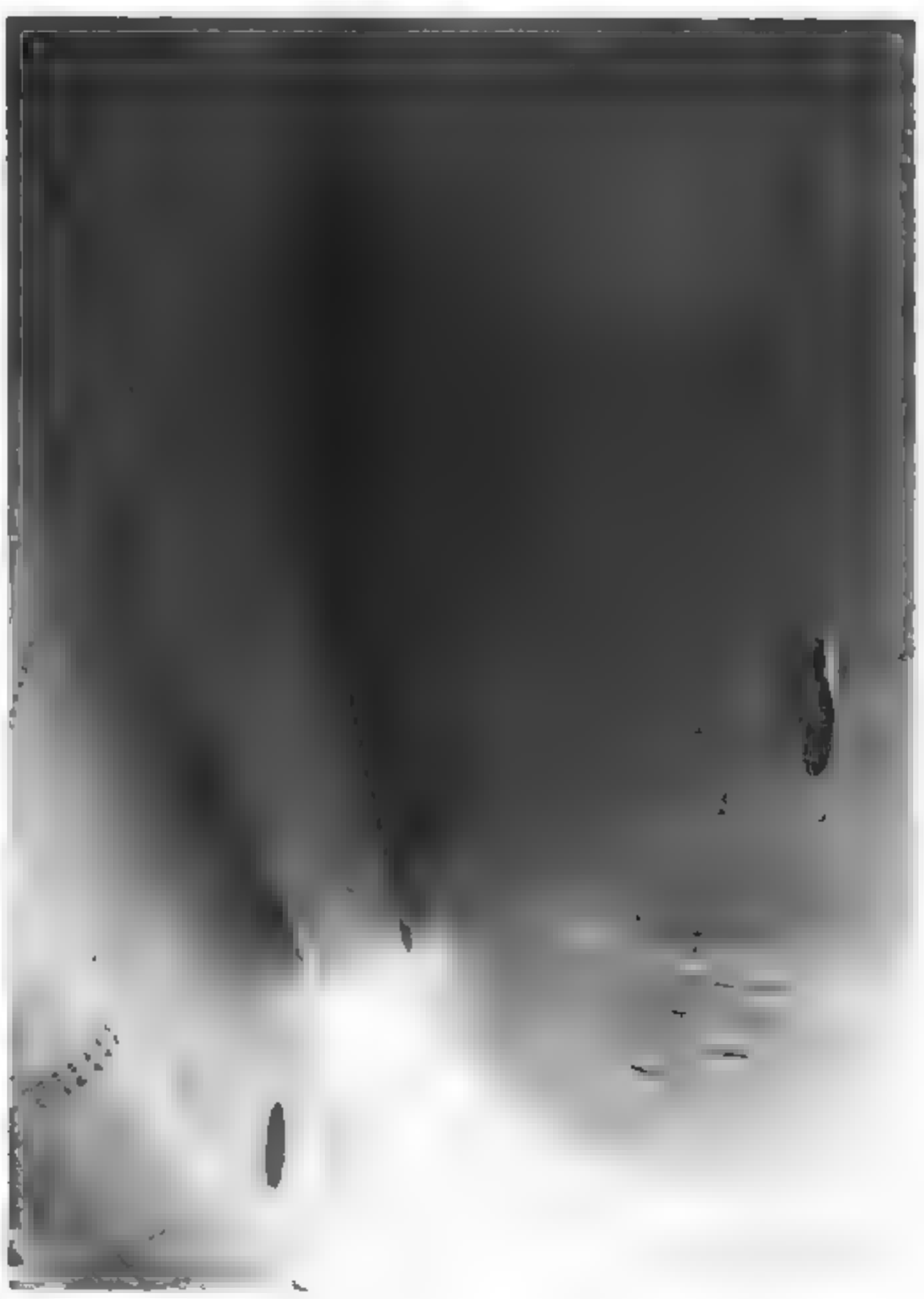


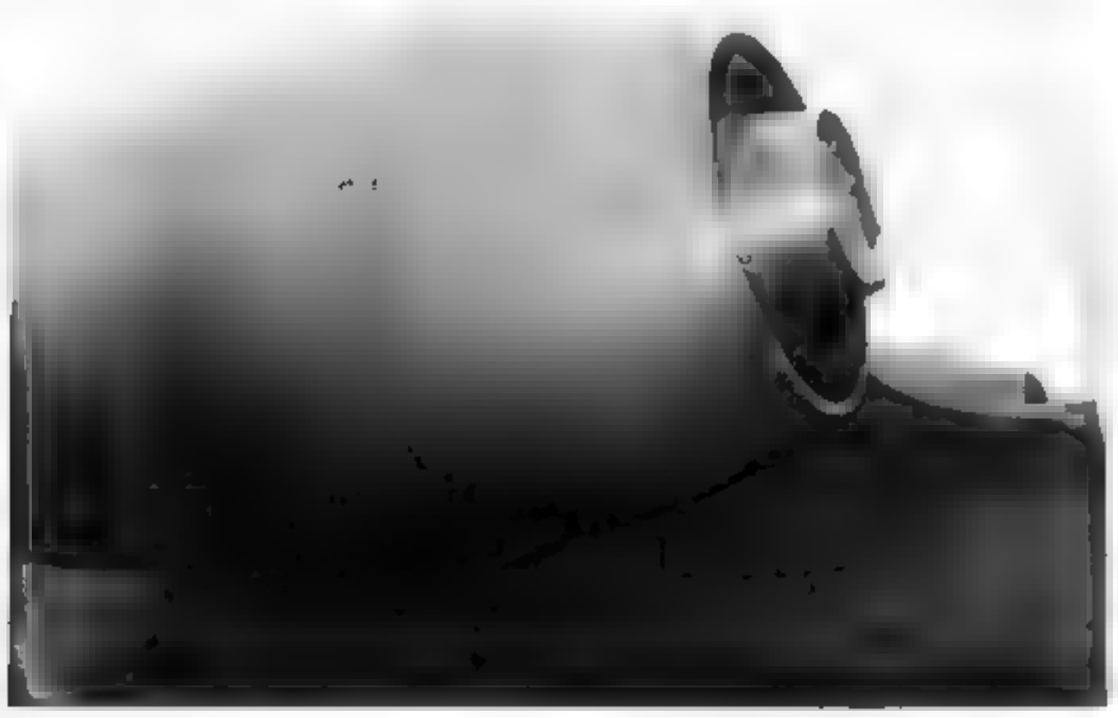


Left upper: Looking aft from beneath the fuselage, with the centreline stores pylon (No 6 station) prominent
Left lower: Looking forward from beneath the tailp ane Nos 8, 9 and 11 stations, on the starboard wing, have py ons in p ace
Top: A close-in view of the centre ine pylon
Above: Underside of rear fuselage has three prom nent features – VHF/FM antenna forward, VHF/AM antenna aft, and fue dump pipe offset to port
Right: Auxil ary power unit (APU) exhaust outlet, located beneath engine pod on port s de Note heat resistant plate

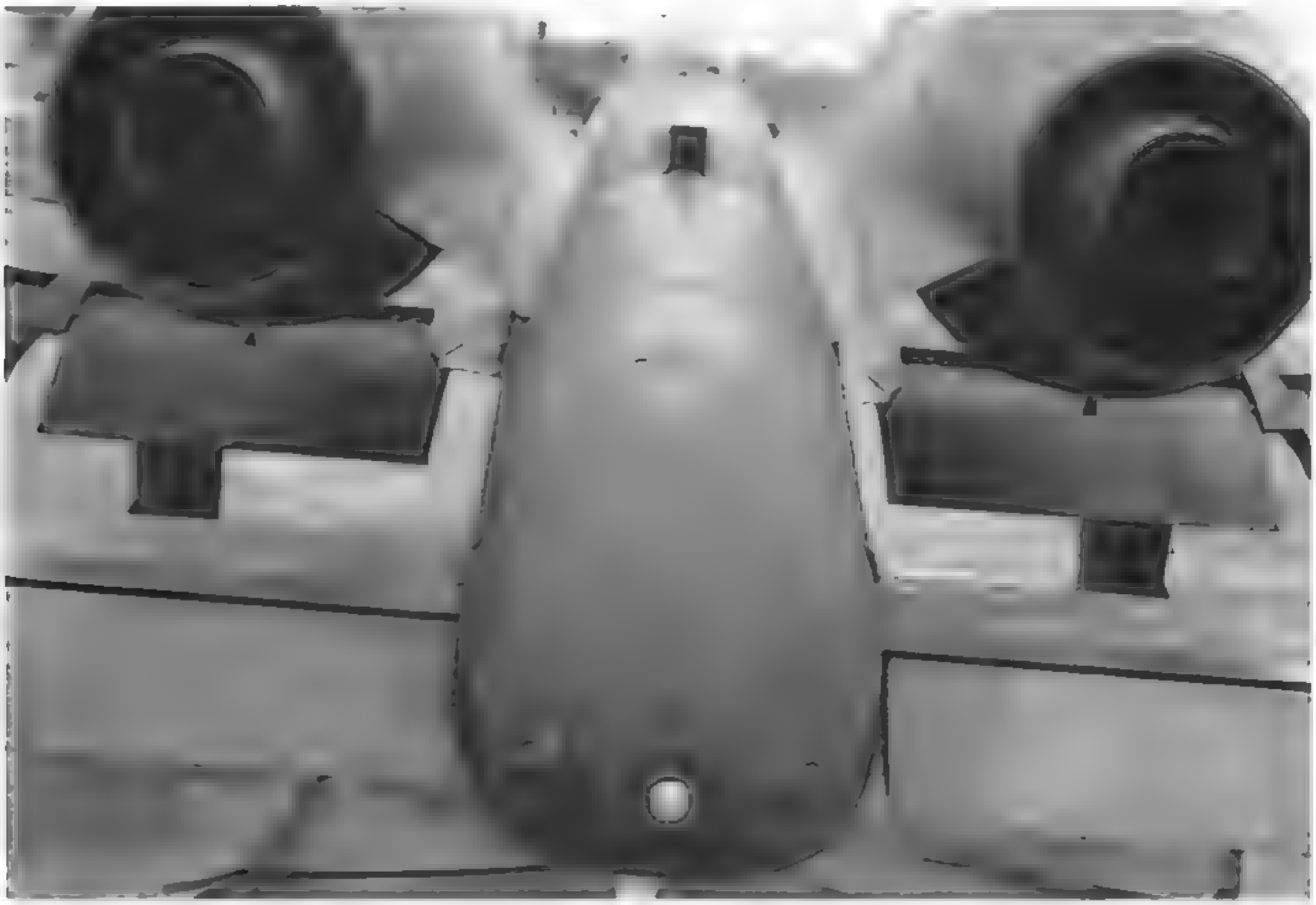
Left upper: The A 10's engine pods are spaced suffic ent y far apart to make the possibility of a single hit putting both units out of action almost neg igible, yet they are close enough to assure good sing e-engine control in the event of one not funct oning. Moreover, their high-set pos tion affords them a fa r degree of protection from ground f.re
Left lower: The two TF34 turbofans, in common w th the a rcraft's fins, slats and other small parts are not handed – any A 10 powerplant will f t either pod
Right: Rear view of the starboard pod, showing the upward-t lting exhaust nozz es. TF34s a so power the Navy's S-3 Viking ant submarine aircratt
Below left: Quick-re ease atches permit the entire central segment of the pod to be hinged upwards, for easy access when maintenance is required
Below right: Underv ew of starboard pod, showing drain p pe at right The TF34s each deve op some 9000lb thrust

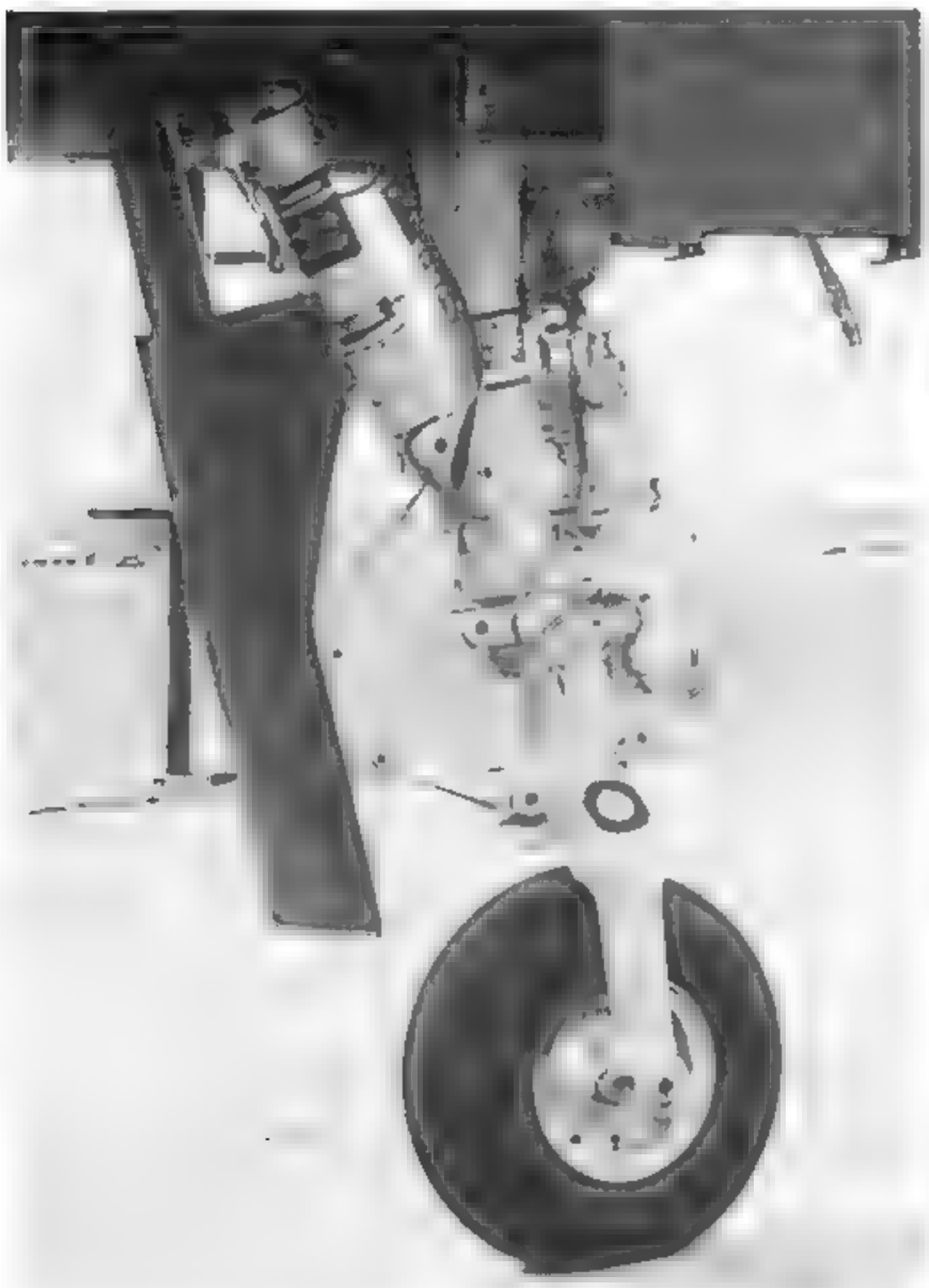




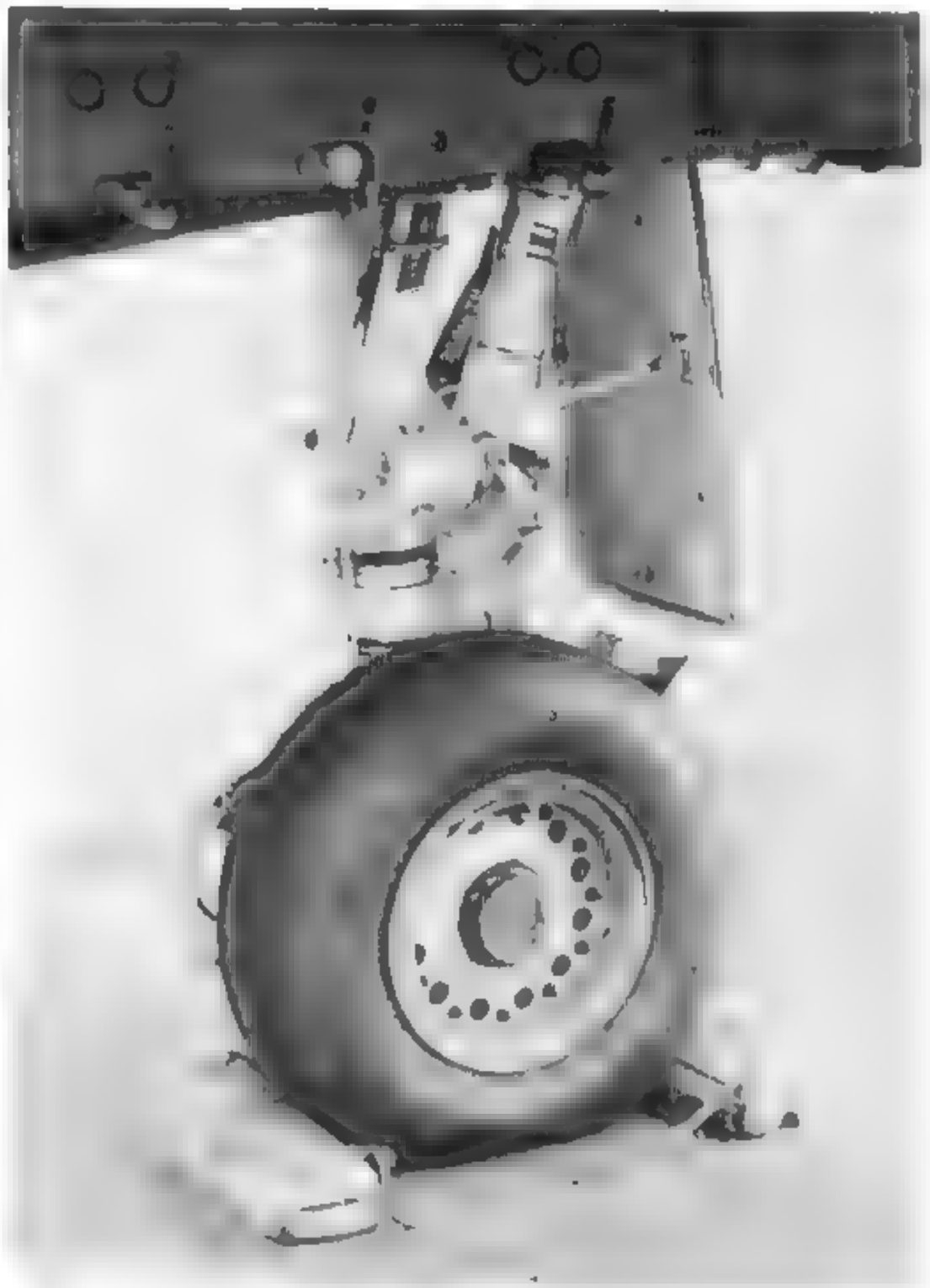


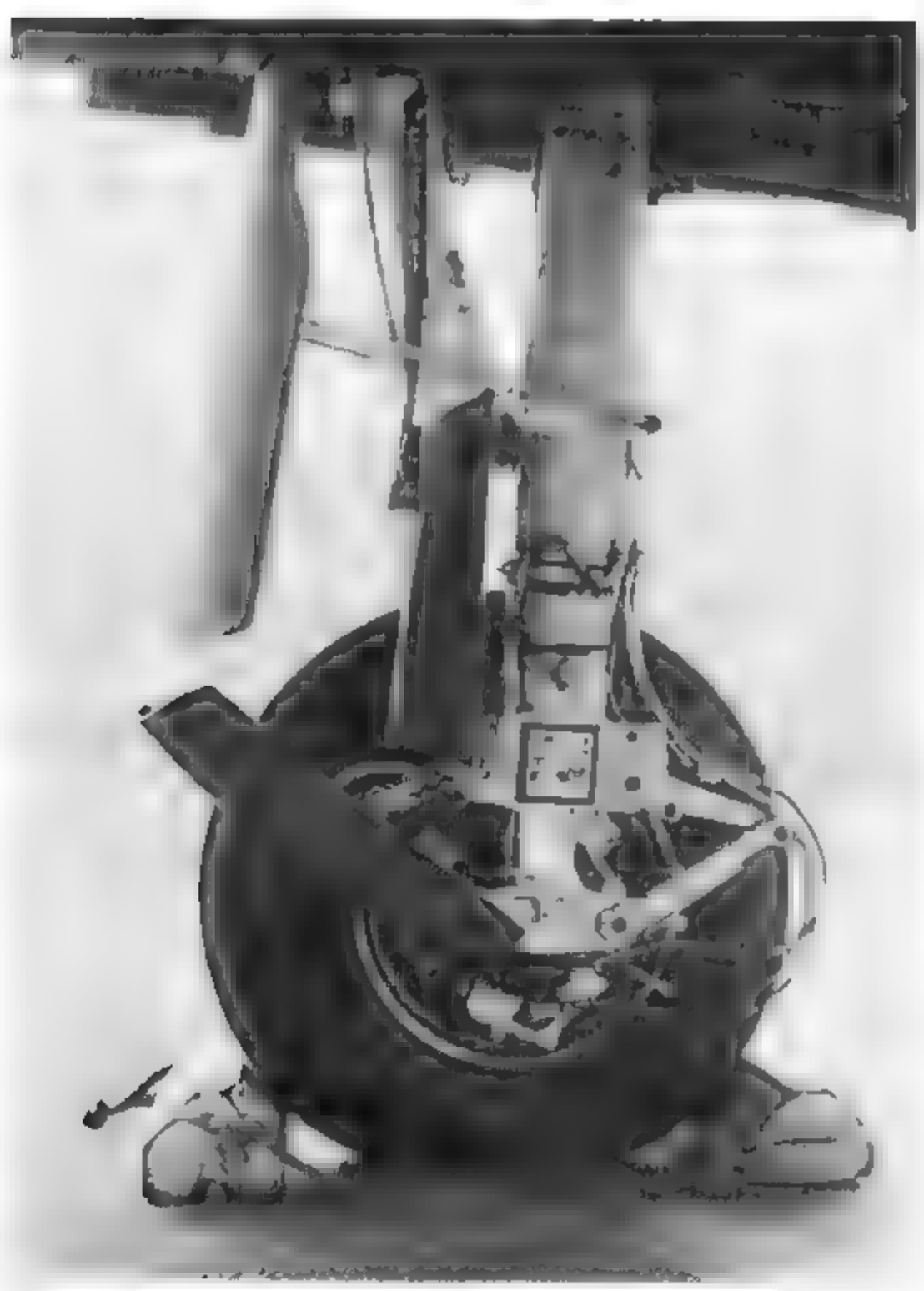
Top: The two tail fins of the A-10 are an important safety feature – the pilot can still get home if he loses one – and also help mask the engine efflux against IR-homing missiles
Above: Upper surfaces of port and starboard tailplanes
Left: Underside view of starboard tailplane
Right top: Rearward-looking RWR domes flank the tail navigation light at the tip of the fuselage empennage. Note pre-cooler intake duct on fuselage top between engine pods
Right: Inboard view of port tailfin. Rudder occupies entire trailing edge
Far right: Outer surface of tailfins feature actuator fairings towards the base. Note hoist symbols (frequently to be seen facing the other way) and plethora of mushroom-head rivets as elsewhere over the A-10's airframe! Aircraft of the 511th TFS are now starting to sport 'AR' tailcodes following assignment to the 10th TFW at Alconbury





Top: Nose undercarriage seen from the starboard side (left photo) and from forward (right) All the A-10 s gear struts retract forwards, which means that they can free-fall under gravity, aided by the slipstream, in the event of a problem with the hydraulic system
Above left: Top of nosegear leg looking forward
Above: Front nosebay door hinges to starboard and commonly features name of ground crewman, as here Note Pave Penny pylon at left
Left: View into the nosewheel bay, looking aft
Opposite page top left: Starboard main gear. Only the strut itself is totally enclosed when the gear retracts; the wheel is left half-protruding from the front of the undercarriage pod
Opposite page top right: Outboard view of port main gear
Right: Inboard view of port main gear. See also page 20
Far right: Interiors of mainwheel bays are relatively featureless, though pods have chaff launchers at rear





MISSION

The close air support (CAS) mission requires an aircraft to give the most effective possible relief to ground forces in a battle zone by harassing the enemy, disrupting his tactics, destroying the means by which he engages in combat and otherwise preventing him from achieving his objectives. To this end, the aircraft's weapons are directed against personnel, *matériel* (vehicles, equipment and so forth) and supply lines. However, the attacks are directed at targets in the immediate area of the conflict and not at distant objectives.

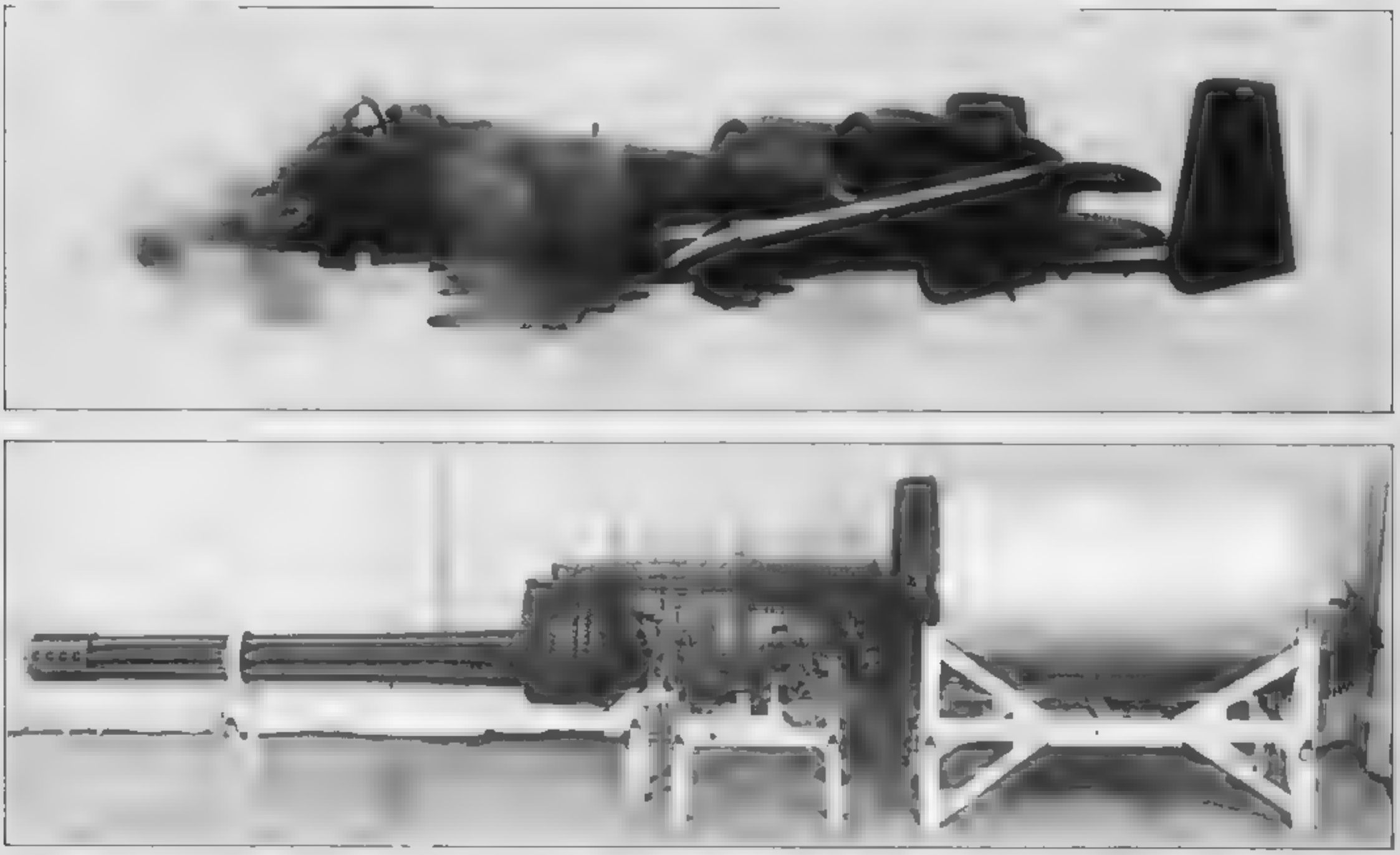
A number of problems are thereby posed. First, the aircraft has to respond quickly, which means that it must be based nearby, perhaps at a temporary, makeshift airfield. Second, it must be able to fly at low level, at relatively high speeds for ingress but with good low-speed agility so that the pilot can verify his targets visually in what might be a rapidly changing tactical scene involving both friend and foe in close proximity beneath him. Third, as we have noted, the nature of the attack profile, involving relatively slow flight at low altitude in, probably, clear weather, means that the aircraft will inevitably attract ferocious ground fire and thus has to be capable of absorbing great damage. Fourth, a variety of weapons, each suited to a particular type of target, needs to be fitted.

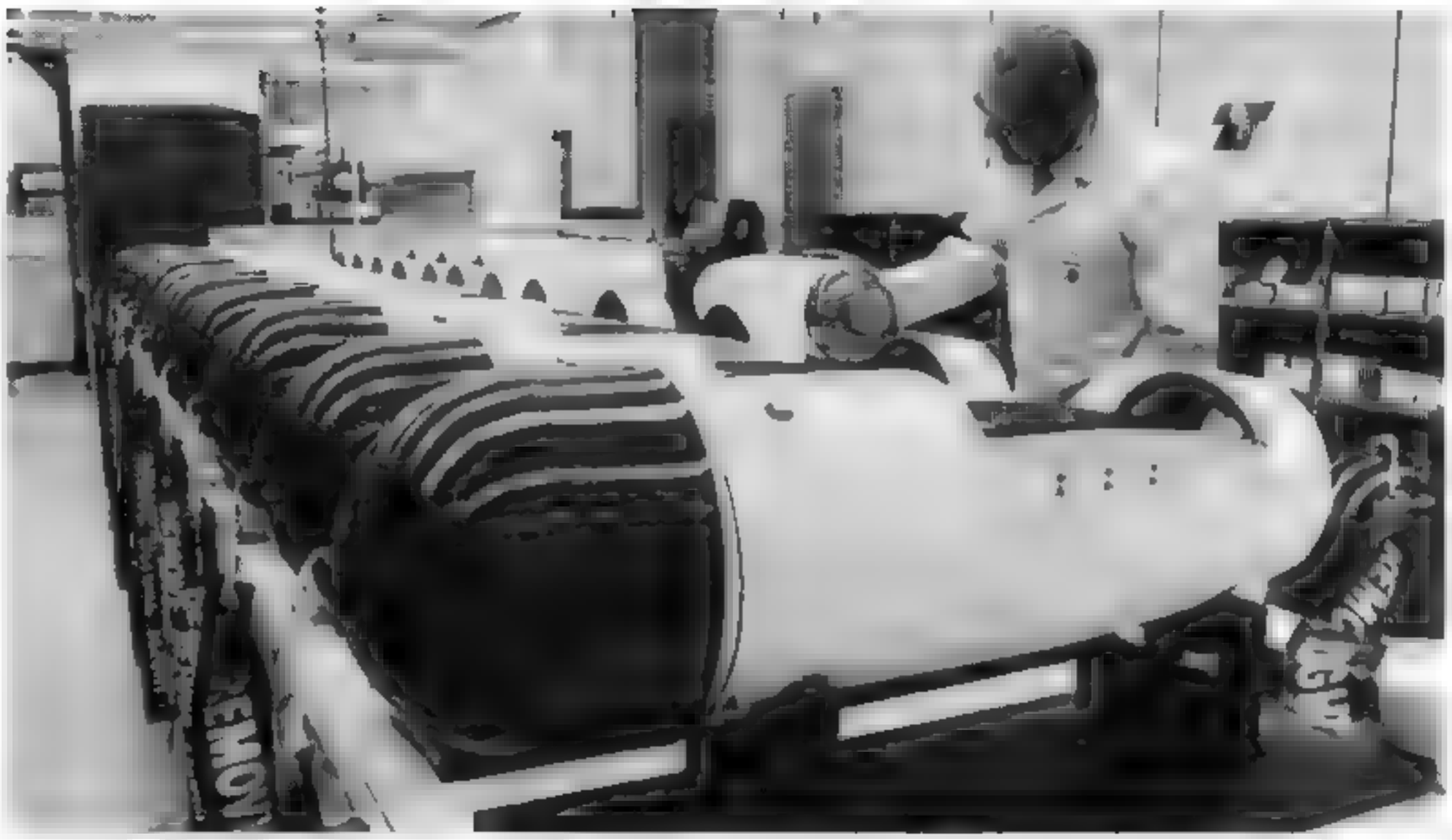
The principal weapon carried by the A-10 is the huge, seven-barrelled GAU-8/A, often referred to as the Avenger. Some indication of the size of this gun can be appreciated from the fact that it weighs, empty, getting on for a ton and accounts for almost a tenth of the entire weight of the aircraft. Pumped out at 4000 rounds a minute, the enormous shells are of three basic types, high-explosive incendiary, practice, and armour-piercing incendiary, the last incorporating an ignitable depleted uranium penetrator capable of punching a hole through a classified (but very great) thickness of tank armour.

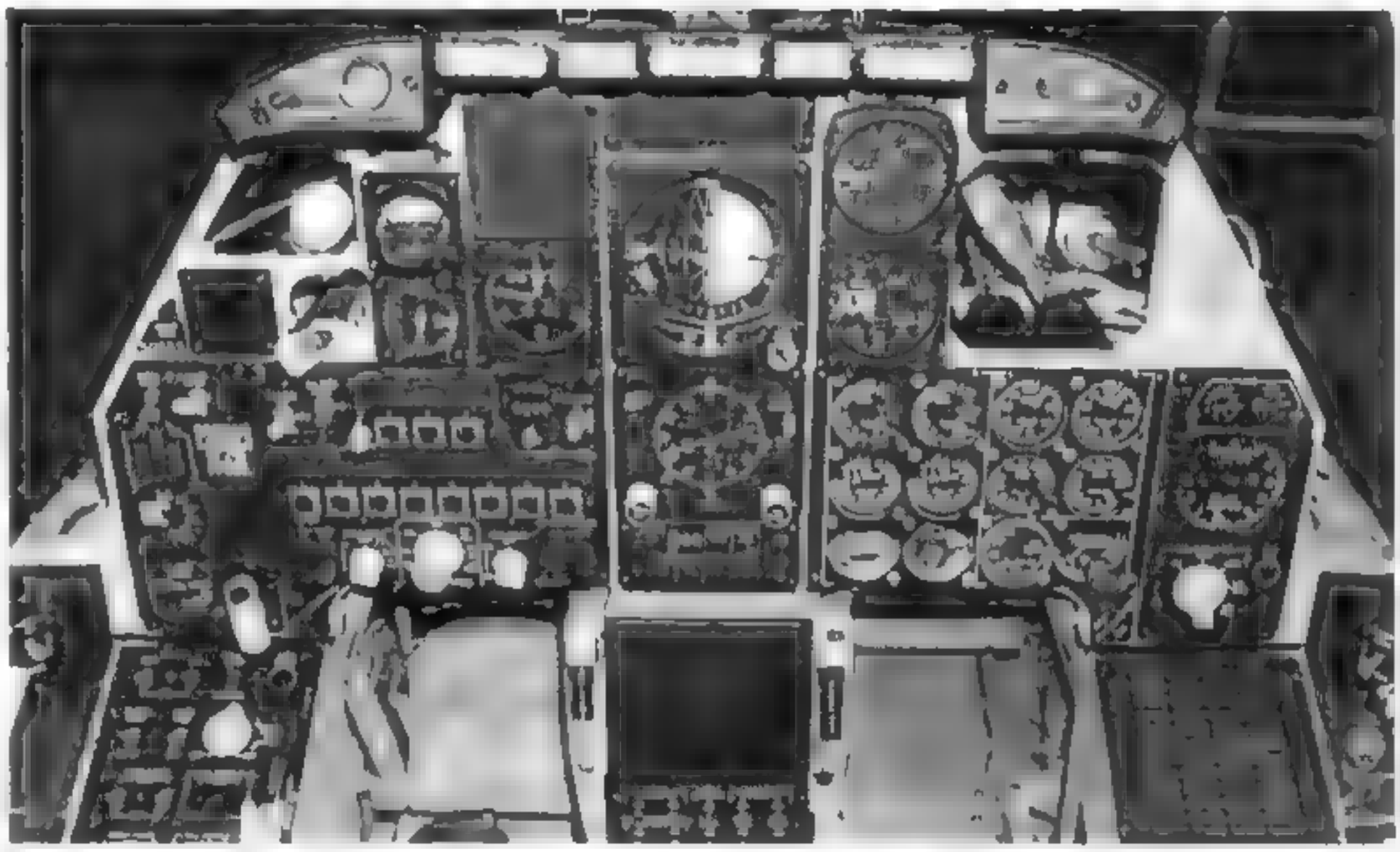
The eleven stores stations can, together, accept a maximum load of 16,000lb, though this figure is achieved only at the expense of a percentage of the internal fuel. The fuselage centreline is stressed for 5000lb, the four centre-section stations for 3500lb each, the first outboard stations for 2500lb and the four outers for 1000lb each. The principal weapons carried are free-fall Mk 82 and Rockeye cluster bombs, CBU dispensers, GBU-10 laser-guided bombs, LAU-3 rocket pods and AGM-65 Maverick missiles. For ECM self-protection, a Westinghouse ALQ-119 jamming pod is frequently fitted to one of the outermost wing stations.

A vital component in the A-10's mission is the AAS-35(V) Pave Penny pod. Designed and manufactured by Martin Marietta, this is a miniaturised, day-or-night laser-target identifier capable of searching for, tracking and locking on to reflected laser energy.

Main illustration: The AGM-65 Maverick is almost tailor made for the A-10, being capable of destroying hard, moving targets such as tanks. Two versions are available, TV-guided or infra-red homing. This A-10 carries two of the latter. *Hughes*
Right upper: A 23rd TFW sharkmouthed A-10 is enveloped in smoke as its 30mm cannon is tried out *Fairchild Republic*
Right lower: GAU-8/A and ammunition drum. *General Electric*





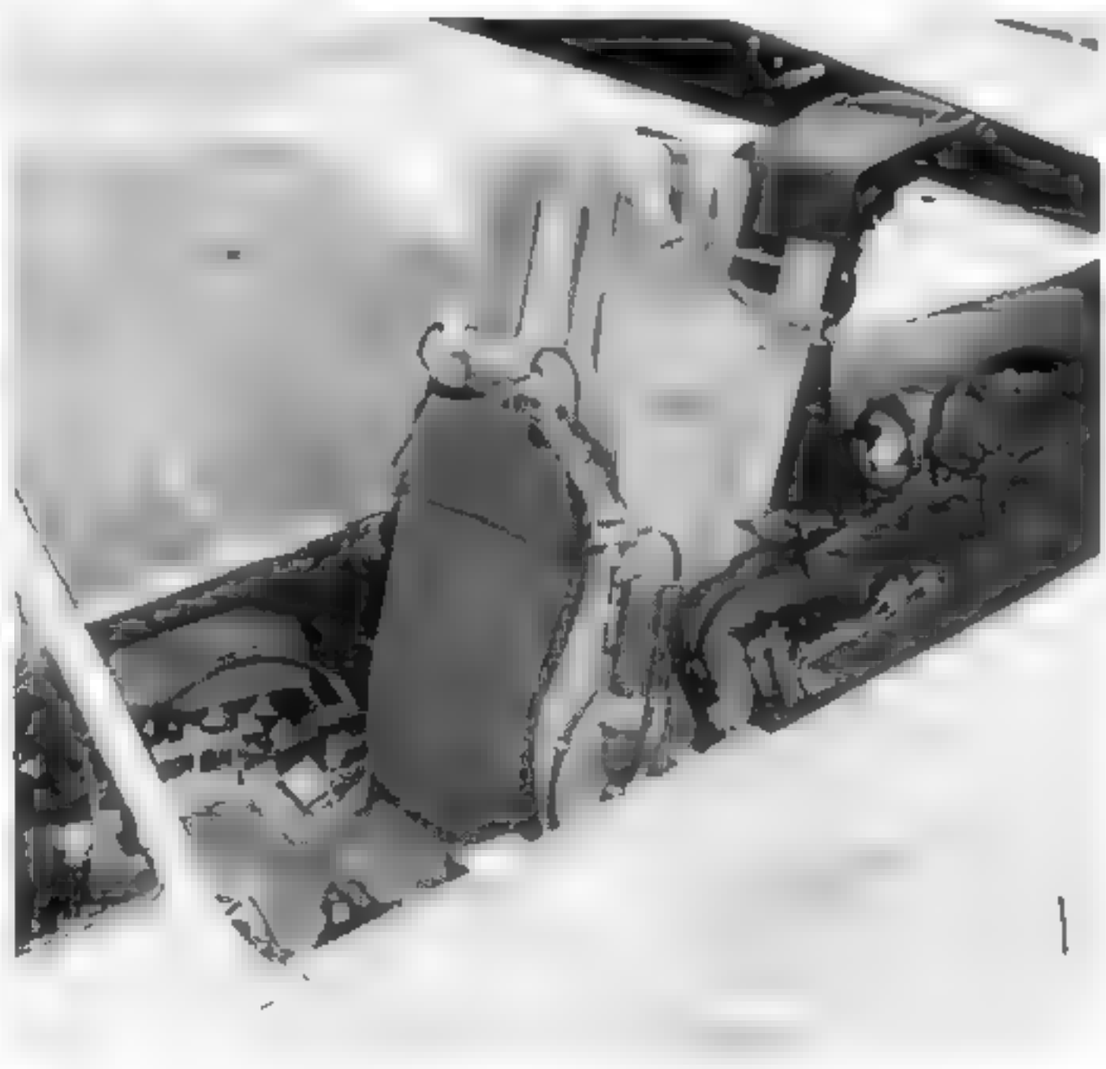


Right upper: The A-10 is not overloaded with sophisticated avionics – indeed, until recently it could not even boast an inertial navigation system – but it can carry a number of very effective sensors to improve its mission capability. The most commonly seen external fit is the AAS-35(V), otherwise known as Pave Penny, which picks up laser energy 'bounced off' a target by a friendly designator, and enables the A-10's weapons to home in accurately. Here new Pave Penny pods are checked out prior to delivery. *Martin Marietta*

Right lower: Instrument panel of the fourteenth production A-10. The vacant position at top right is where the Maverick video display is located. *Fairchild Republic*

Below left: Detail view of the port console, with the control stick in the foreground and the throttle quadrant at upper left. *Fairchild Republic*

Below right: Installation of the ACES II ejection seat, production A-10. The canopy sills are set low relative to the pilot's position because of the need for him to view the battlefield beneath. The titanium armoured 'bathtub' surrounding the cockpit gives protection against the heavy ground fire which can be expected to greet him on a CAS sortie. *Fairchild Republic*

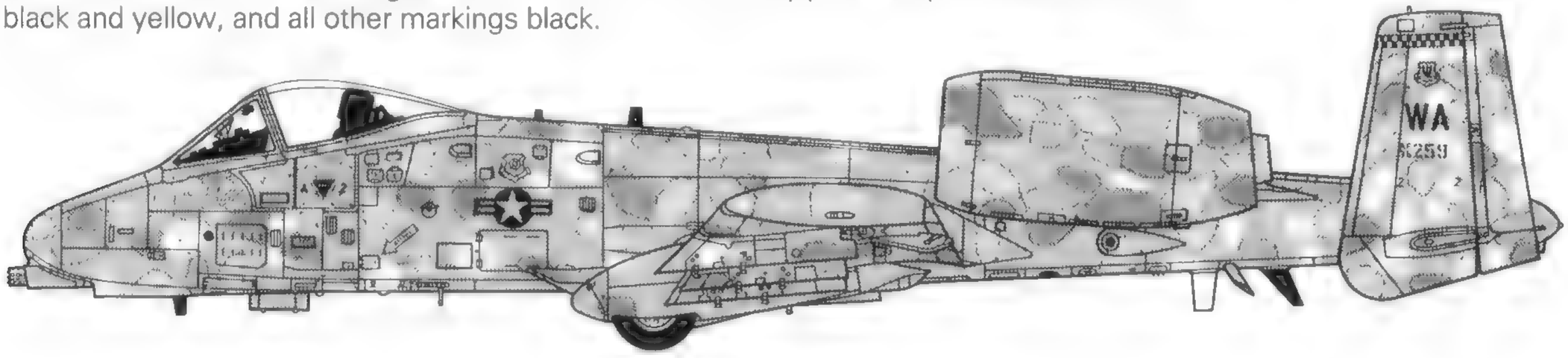


SQUADRON SERVICE

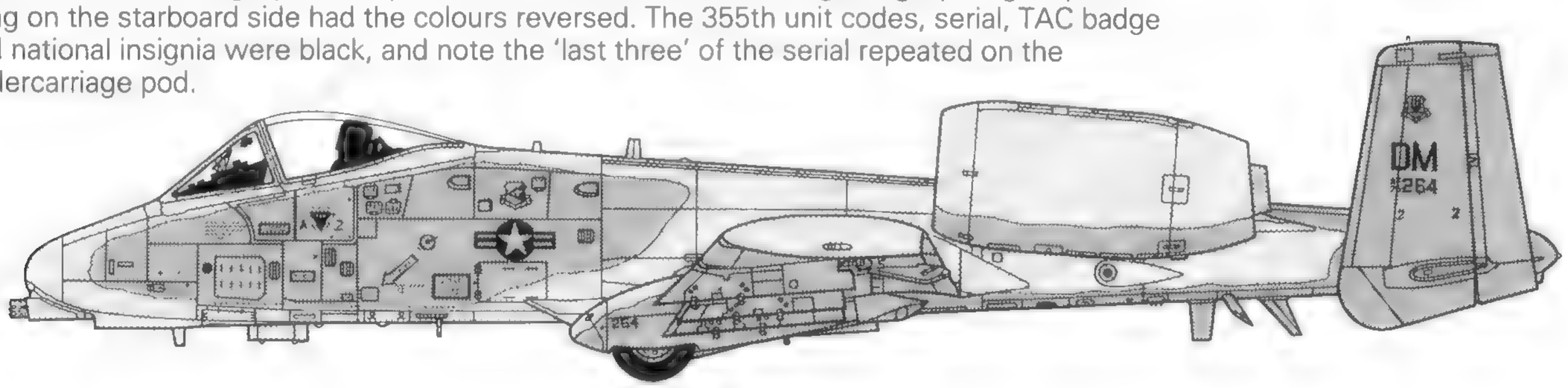
The integration of the A-10 into the US battle line took considerable thought: the aircraft was, after all, not merely a new machine but a whole new concept. Accordingly, a special project known as the Joint Attack Weapons Systems (JAWS) was set up in 1977 to investigate the best methods of employing the A-10 alongside other battlefield attack components such as helicopters and gun batteries and ensuring that each would work in the best interests of all. The trials, held at Fort Hunter Liggett in California, were a resounding success and led to the Joint Air Attack Team (JAAT) concept in which the disciplines for successful teamwork were laid down. Concurrent with the trials, a series of experimental camouflage schemes were tested on the A-10, including a bizarre random application ('pattern' is an inappropriate term here) of tans, greens and greys known unofficially as 'Measles' of 'Afrika Korps Revisited'. Most early production aircraft were subsequently given a short-lived 'standard' finish of light greys, applied asymmetrically port and starboard, and later aircraft received a symmetrical two-grey scheme. However, the majority of A-10s are now seen in the 'European I' finish illustrated on pages 34–35 of this volume.

Six squadrons of A-10s are based in Great Britain, two (92nd and 510th TFS) at Bentwaters, two (78th and 91st TFS) at nearby Woodbridge and two (509th and 511th TFS) at Alconbury, the last having moved from the 81st TFW at Bentwaters to form the 10th TFW in April–May 1988 under a programme designated 'Creek Bolt'. In the continental United States, A-10s are primarily assigned to TAC, Air Force Reserve and Air National Guard units. They equip the 74th, 75th and 76th TFS (23rd TFW; code 'EL') at England AFB, the 353rd, 355th and 356th TFS (354th TFW; code 'MB') at Myrtle Beach AFB, the 333rd, 357th and 358th TFTS (355th TTW; code 'DM') at Davis-Monthan AFB, the A-10 FWS and 422nd TES (57th FWW; code 'WA') at Nellis AFB and the 4485th TS (TAWC; code 'OT') at Eglin AFB. In AFRES service they make up the 45th TFS (434th TFW) at Grissom AFB, coded 'IN'; the 46th TFTS and 47th TFS (917th TFG) at Barksdale AFB, coded 'BD'; the 303rd TFS (442nd TFW) at Richards-Gebaur AFB, coded 'KC'; and the 706th TFS (926th TFG) at New Orleans NAS, coded 'NO'. In ANG service, the aircraft equips the Maryland (104th TFS, 175th TFG; code 'MD'), the Connecticut (118th TFS, 103rd TFG; 'CT'), the Massachusetts (131st TFS, 104th TFG; 'MA'), the New York (138th TFS, 174th TFW; 'NY') and the Wisconsin (176th TFS, 128th TFW; 'WI') Guards. Alaskan Air Command operates 18th TFS (343rd TFW) A-10s at Eielson AFB with the tail code 'AK', and PACAF has the 25th TFS (51st TFW) flying A-10s out of Suwon AB in South Korea, coded 'SU'. A few aircraft are on the books at Eglin (3247th TS, 3246th TW; 'AD') and Edwards (6512th TS, 6510th TW; 'ED') under the authority of Air Force Systems Command, while Air Force Logistics Command also operates some out of McLellan AFB.

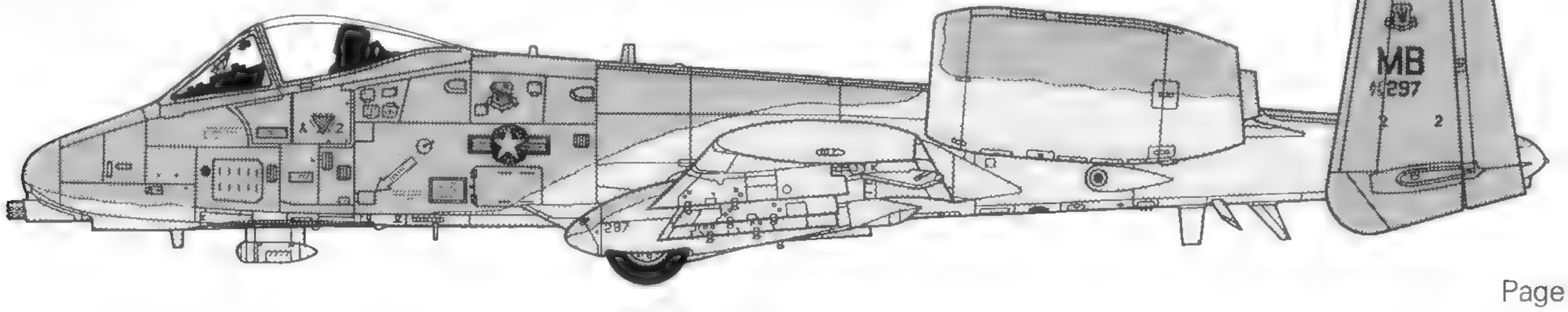
Below: A-10 75-0259, 57th TTW, in one of the famous JAWS schemes, using greens 34092 and 34102, browns 30118 and 30227 and grey 36231 (and, reputedly, other shades mixed up from these!). Stores carried during the JAWS trials were similarly painted up. Checks on tail are black and yellow, and all other markings black.



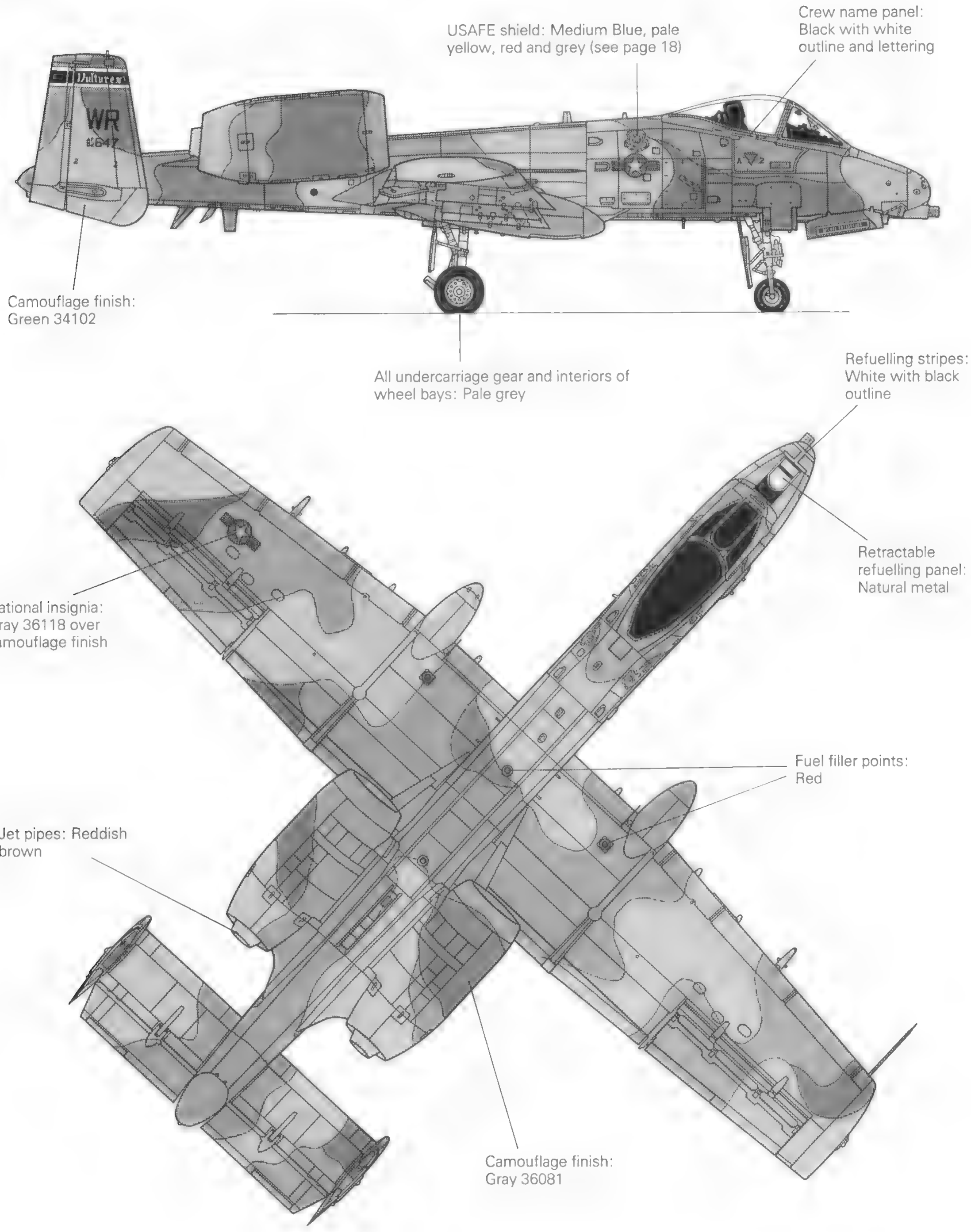
Below: Early asymmetric A-10 scheme consisted of 30 per cent Mask 10A (close to FS. 36270) as the darker grey and 50 per cent (near FS.36559) as the lighter grey. Engine pod and wing on the starboard side had the colours reversed. The 355th unit codes, serial, TAC badge and national insignia were black, and note the 'last three' of the serial repeated on the undercarriage pod.



Below: Pave Penny-equipped A-10A in the second standard scheme, comprising the 30/50 per cent Mask 10A colours but applied symmetrically, and with a false canopy painted beneath the forward fuselage in Gray 36118, which colour is also used for the markings. The serial number 'last three' are again present on the gear pod, and the 345th TFW badge is in the standard position.

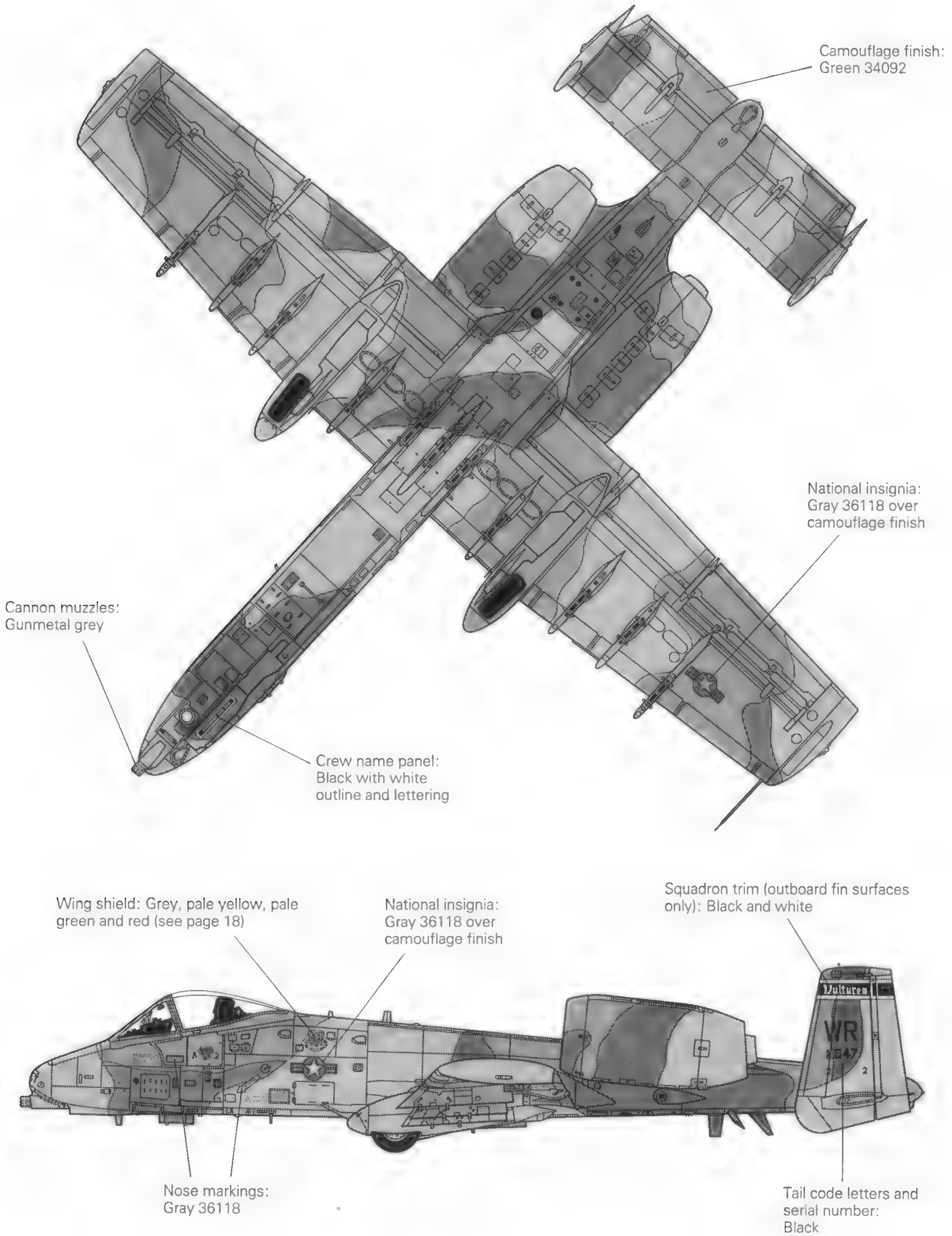


FAIRCHILD REPUBLIC A-10A THUNDERBOLT II, 511th TFS, 81st TFW, RAF BENTWATERS, JULY 1987

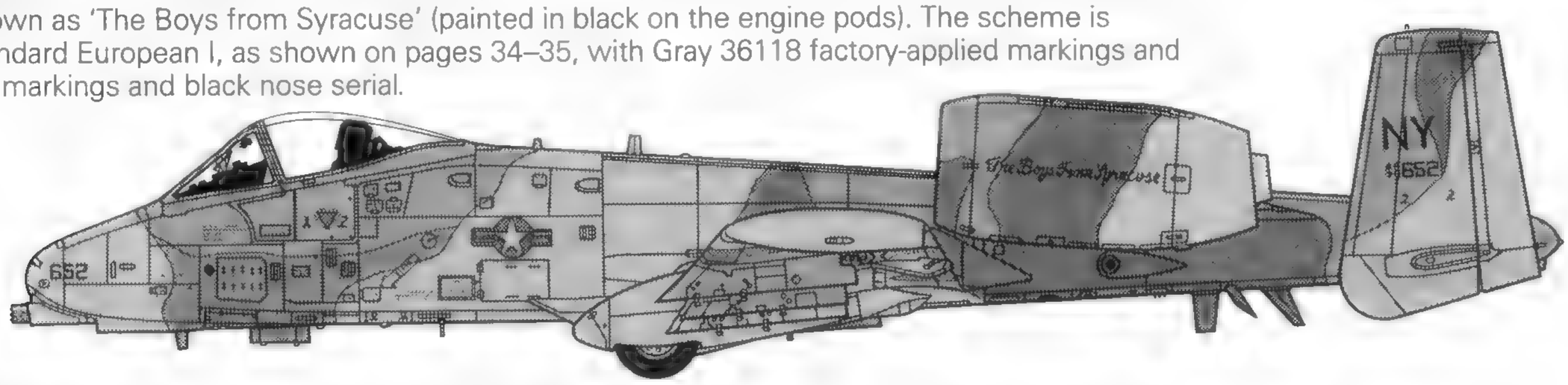


Numbers refer to Federal Standard (FS) 595a listings

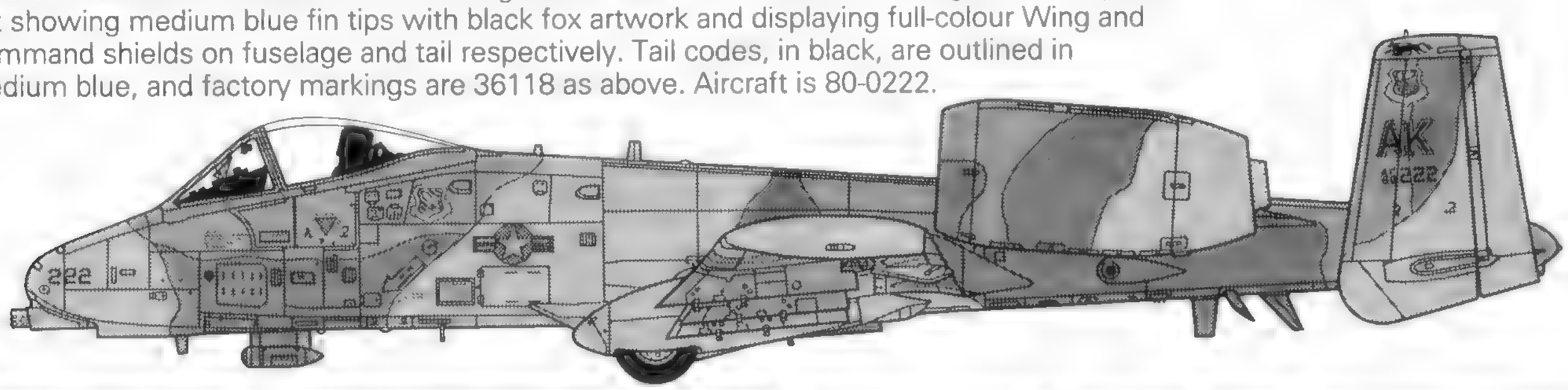
1:96 scale

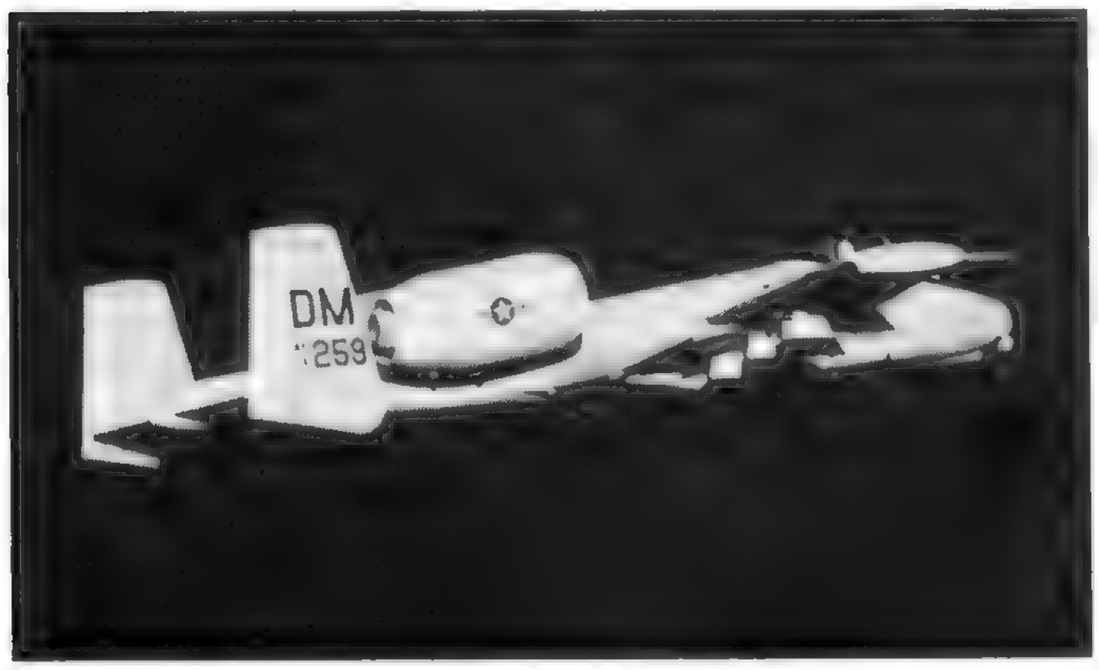


Below: A-10A 78-0652 of the 138th TFS, 174th TFW, New York Air National Guard, otherwise known as 'The Boys from Syracuse' (painted in black on the engine pods). The scheme is standard European I, as shown on pages 34–35, with Gray 36118 factory-applied markings and tail markings and black nose serial.



Below: Alaskan Air Command A-10A assigned to the 18th TFS, 343rd CW, again in European I but showing medium blue fin tips with black fox artwork and displaying full-colour Wing and Command shields on fuselage and tail respectively. Tail codes, in black, are outlined in medium blue, and factory markings are 36118 as above. Aircraft is 80-0222.





Above: The second production A-10, overall 36375, with large-size tail markings (black) and, very unusually, the national insignia applied to the nacelles, circa 1976. *Fairchild Republic*

Right: A pair of Connecticut ANG aircraft in European I camouflage. *Fairchild Republic*

Below: Myrtle Beach-based 354th TFW A-10s in European I. Note the ALQ-119 jammer under the wing. *US Air Force*

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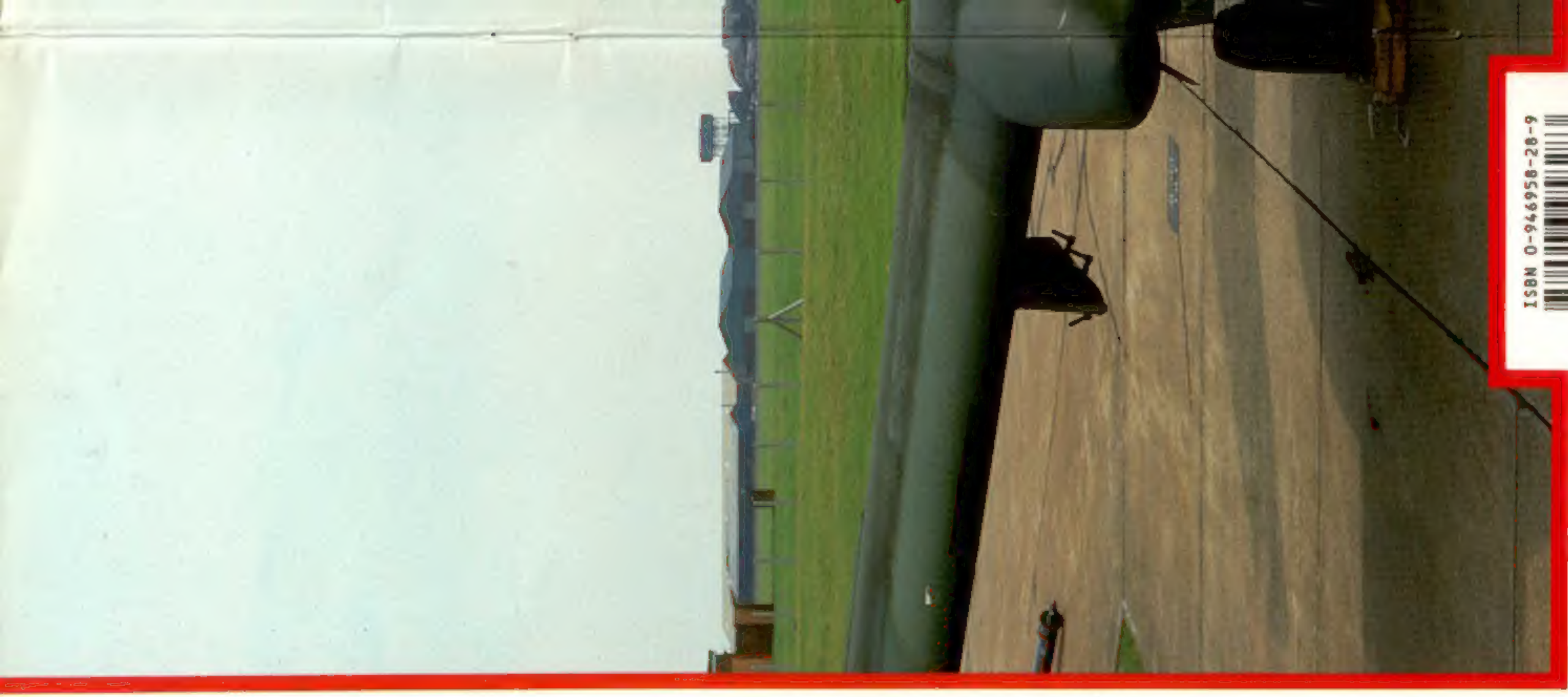

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